15 YEARS OF INTERNET IN INDIA

<Retrospectives and Roadmaps>

netch@kra

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ACRONYMS AND ABBREVIATIONS

ADSL	Asymmetric Digital Subscriber Line
ASP	Active Server Pages
BBS	Bulletin Board System
BITNET	Because It's Time Network
BPO	Business Process Outsourcing
CDMA	Code Division Multiple Access
CD-ROM	Compact disk, read-only memory
CLC	Community Learning Centre
CMS	Content Management System
CSO	Civil Society Organisation
DNS	Domain Name System
EDGE	Enhanced Data GSM Environment
EDI	Electronic Data Interchange
FLAG	Fiber-Optic Link Around the Globe
FTH	Fiber to the Home
GIS	Geographical Information System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GPSS	Gateway Packet Switching System
GSM	Global System for Mobile communications
HDI	Human Development Index
HDR	Human Development Report
HTML	Hyper Text Mark-up Language
HTTP	Hyper Text Transfer Protocol
ICT	Information and Communication Technologies
ICT4D	ICT for Development
IDN	Internationalised Domain Name
INDEST	Indian Digital Library in Engineering Science & Technology
IPO	Initial Public Offering
IPv6	Internet Protocol Version 6
IRC	Internet Relay Chats
ISP	Internet Service Provider
IT	Information Technology
ITeS	IT-enabled Services
IVRS	Interactive Voice Response Systems
LAN	Local Area Network
MDGs	Millennium Development Goals
NEGP	National E-Governance Plan

NGO	Non-governmental Organisation
NIC	National Informatics Centre
NPTEL	National Programme on Technology Enhanced Learning
NRI	Network Readiness Index
PAD	Packet Assembler-Disassembler
PCO	Public Call Office
PDA	Personal Digital Assistant
PoP	Point of Presence
PPP	Public-Private Partnership
PSTN	Public Switched Telephone Network
RFC	Request for Comment
SDC	State Data Centre
SITE	Satellite Instructional Television Experiment
SME	Small and Medium Scale Enterprise
SMME	Small, Medium and Micro Enterprises
SMS	Short Message Service
STD	Subscriber Trunk Dialling
SWAN	State-Wide Area Network
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Universal ID
USO	Universal Service Obligation
UUCP	Unix-to-Unix Copy
UUNET	UNIX to UNIX Network
VAS	Value-Added Service
VC	Venture Capitalist
VLE	Village-level Entrepreneur
VoIP	Voice over Internet Protocol
VSAT	Very Small Aperture Terminal
Y2K	Year 2000
WANs	Wide Area Networks
WAP	Wireless Application Protocol
WiFi	Wireless Fidelity
WiMax	Worldwide Interoperability for Microwave Access
WLL	Wireless in Local Loop
X.25	Protocol suite for packet switched WAN communication

ORGANISATIONAL ACRONYMS

AIIMS	All India Institute of Medical Sciences
AMIC	Asian Media Information and Communication Centre
APDIP	Asia-Pacific Development Information Programme
APNIC	Asia Pacific Network Information Centre
BARC	Bhabha Atomic Research Centre
BSE	Bombay Stock Exchange
BSNL	Bharat Sanchar Nigam Limited
CCITT	International Consultative Committee for Telegraph and Telephone
CCAOI	Cyber Café Association of India
C-DAC	Centre for Development of Advanced Computing
CED	Centre for Education and Documentation
CERN	Center for European Nuclear Research
CERT	Computer Emergency Response Team
CMIE	Centre for Monitoring Indian Economy
DARPA	Defense Research Projects Administration
DIT	Department of IT
DOE	Department of Electronics
DOT	Department of Telecommunications
EISPAI	E-mail and Internet Service Providers Association
ERNET	Education and Research Network
GSM	GSM Association
IAB	Internet Architecture Board
IAMAI	Internet & Mobile Association of India
ICANN	Internet Corporation for Assigned Names and Numbers
ICRTC	Indian Railways Catering & Tourism Corporation
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Centre
IETF	Internet Engineering Task Force
IGF	Internet Governance Forum
IIM	Indian Institute of Management
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IMRB	Indian Market Research Bureau

INFLIBNET	Information and Library Network
ISD	International Subscribers Dialing
ISOC	Internet Society
ISPAI	Internet Service Providers Association of India
ISRO	Indian Space Research Organisation
ITU	International Telecommunication Union
MAIT	Manufacturer's Association of IT Industry
MCA	Ministry of Corporate Affairs
MFI	Micro-Finance Institution
MHRD	Ministry of Human Resource Development
MTNL	Mahanagar Telephone Nigam Ltd
NASDAQ	National Association of Securities Dealers Automated Quotations
NISG	National Institute of Smart Government
NIXI	National Internet Exchange of India
MSSRF	MS Swaminathan Research Foundation
NASSCOM	National Association of Software and Service Companies
NCSDCT	National Centre for Software Development & Computing Techniques
NCST	National Centre for Software Technology
NSDL	National Securities Depository Limited
NSE	National Stock Exchange of India
SEBI	Securities and Exchange Board of India
STPI	Software Technology Parks of India
TDSAT	Telecom Disputes Settlement And Appellate Tribunal
TIFR	Tata Institute of Fundamental Research
TRAI	Telecom Regulatory Authority of India
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	UN Children's Fund
VJTI	Victoria Jubilee Technical Ins
VSNL	Videsh Sanchar Nigam Limited
WGIG	Working Group on Internet Governance
WIPO	World Intellectual Property Organisation
WSIS	World Summit on the Information Society
WTO	World Trade Organisation

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Part III: Internet Impacts

Internet: Our Friend, Philosopher and Guide!

It is overwhelming to acknowledge the untiring efforts and contributions of supporters while bringing out a compendious publication on "15 years of Internet in India". This is more so when there are wide-ranging interventions, multiple layers of initiatives, diverse stakeholders, and critical levels of successes, failures, hope and hype.

The role of the wider Internet fraternity in India has to be appreciated for making the Internet a platform of the people, by the people and for the people. The desired outcomes would not have been achieved but for diligent development of the Internet as a new media platform to address development and governance challenges at all levels, including the bottom of the pyramid.

The role of the key stakeholders is critical in scaling the Internet for development agenda in this country. The Department of Information Technology and Department of Telecom, both under Ministry of Communications and Information Technology, now play quite a vibrant role in introducing infrastructure, services, content and delivery mechanisms.

The industry, no doubt, played an unparalleled role in promoting the Internet in India in its embryonic phases. , joined by civil society, academic institutions and independent agencies. Despite some obstacles and roadblocks, contributions from each of the stakeholders have made the difference. Key lessons have been learnt by now for future course correction and action based measures.

The consent and willingness of the experts in this publication to contribute informative and useful chapters is highly acknowledged. But for the quality time, energy and dedication from these professionals, this publication would not have been possible. Each of the authors was receptive enough to understand the necessity of bringing out this publication and their commitment is visible through the pages in this volume.

We would also like to express our deep sorrow at the unfortunate demise of serial IT entrepreneur Ajit Shelat, who had committed to writing a chapter in this book but unfortunately passed away in a car accident on the Mumbai-Pune highway in September 2010. An alumnus of IIT-Bombay, he was the director of Nevis Networks and founder of SwitchOn Networks (acquired by Canada's PMC-Sierra in the year 2000 for US$ 450 million), and previously Rimo Technologies. His loss is a great blow to the IT and development fraternity in India. We express our sincere and heartfelt condolences to members of his family.

We also thank those who ungrudgingly contributed their time and ideas through interviews and resources for this book.

This volume includes contributions from a wide range of experts, each with a delightfully different style of writing. We value the authentic and original narratives of these pioneers. Although the writing styles vary across the book, this diversity in a sense captures the spirit of the Internet: a celebration of varying media, but accessible through one common plat form. Policymakers and academicians rub shoulders with entrepreneurs and corporate chieftains, to make for an interesting orchestra in the Internet movement.

A major player in the global Internet movement is VeriSign, and we thank them for their interest in larger good of the Internet and especially their deep interest in India. This book was made possible through the support of VeriSign Sárl.

We wish to thank in advance all those who read the book and its companion website, and offer advice and suggestions (e.g. updates to the Internet Chronology in the book and online). We would like to place on record our heartfelt appreciation to NIXI for their partnership in this book project.

In a heartening move, Sam Pitroda, Advisor to the Prime Minister on Public Information Infrastructure and Innovations agreed to contribute the Epilogue for the book. We sincerely appreciate his boundless enthusiasm via his new position to connect the entire country through broadband. We also express equally sincere thanks for the endorsement and encouragement by Jyotiraditya M Scindia, Honourable Union Minister of State for Commerce, who agreed to write the Foreword.

For the theme of this book - the role of the Internet in India - the Ministry of IT and NIXI (National Internet Exchange of India) are very important. And thankfully, N. Ravi Shanker, Joint Secretary at DIT, not only agreed to write the Prologue but wrote it in such an evocative manner that it will leave a deep impact on all readers. Our hearty thanks to him for his contribution and also agreeing to be co-publisher of the book as CEO of NIXI.

For supportive resources to make this book possible, we are indebted to Aashima Rathee, Amarendra Srivastava, Syed S. Kazi and Ritu Srivastava for researching, referencing, editing and making sure that we go to bed with a clean copy. Any mistakes remaining may be kindly regarded as human error. As always, the final pressure is on the designers, and we feel that the design team of Shaifali Chikermane and Sapna Subba have done a great job of laying out the 29 chapters in mono colour.

At the end, it must be realised that a publication like this is a product of multiple contributions and the result is truly democratic, diverse and colourful. We hope the effort to bring many voices into one fold as far as the Internet in India is concerned has been successful.

We would also like to thank the Internet: our friend, philosopher and guide!

Thank you!

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Preface

Osama Manzar

Internet: The Biggest Equaliser

While the 15 years of Internet in India has proven it to be a democratic innovation and a potent equaliser, the challenges that it continues to throw to India are enormous. The prospect of accessing the Internet is still farfetched for the 250,000 Panchayats, 26 million MSMEs, 3.3 million NGOs, and 1.3 million schools in India – the task is cut-out for those taking Internet to the grassroots.

It has been established that the Internet can be a great equaliser. This is turning out to be an astounding truth for the global society as it searches for ways and means to make WWW a great democratic and equal opportunity platform, cutting across class, gender, culture, language, religion and regional divides. As one looks back at the series of innovations till date, the Internet emerges as one invention that has managed to unleash unparalleled social and economic revolutions and now political changes as well. While the socio-economic gains have been phenomenal, the seeds of change have also been sown elsewhere, in the much larger democratic society in many parts around the world.

Global society is suddenly much different today from what it was for several centuries or even till late 20th century. And among those millions who swear by the Internet, I consider myself fortunate to be a part of this paradigm shift. I see a very strong thread between democracy and Internet. What democracy stands for is what Internet is; supporting the basic principle – people's power at the centre stage – creating an environment of equal society, equal opportunity, irrespective of whether one is rich or poor, enabled or not enabled or whenever and wherever one is placed. There are critical examples to share including my personal experiences of how Internet enabled me to cause beneficial impacts in various sectors and communities. Today, I envision today-that India could become the world's best knowledge procurement base, for the good of the world and its inhabitants.

Internet has become congruous with the basic democratic rights, right of expression of speech, right to information, right to access, and produce information, right to hear and be heard, right to be a consumer and a producer and most of all, right to be a global citizen. There is no other platform that could equal the Internet. With these basic paradigms, undoubtedly, Internet has become the largest and the most potent source of revolution globally, of any kind. As we crisscross the technology and development terrain, Internet, modernisation and growth have become synonymous. Nevertheless, the fallouts equally seek our concentrated attention.

India's tryst with the Internet is what this country has experienced since mid 1990s. From the day the Internet officially came into being in August 1995 there are, a lot many opportunities that have both been realised as well as missed out. It can be said that the trajectory of India's tryst with Internet is linked to many individual experience trajectories as well. This is amply demonstrated when we see the trajectories of individual experiences linked with the overall journey of Internet in India.

Here, a personal experience will serve greater merit and logic. I feel that my personal indulgence in the internet and what changes it brought to my life have convinced me of its potential as an enabler, equaliser and an empowerment tool. I was born in a village in Champaran in Bihar, where there is still no electricity, grew up in Ranchi as a child of a mechanical engineer in a cosmopolitan colony of HEC (Heavy Engineering Corporation) – the mother factory founded by Jawaharlal Nehru in collaboration with Russia to make more factories of the likes of BHEL, SAIL, etc. I studied in a minority school with Islamic Studies, Arabic and Persian as additional languages beside regular courses; followed others to Aligarh and got admitted to the Aligarh Muslim University – did everything except studies and barely managed to graduate in Physics, not in the usual 3 but 5 years.

Having an interest in newspapers, I decided to lay my hands at journalism and did a one-year diploma program in Journalism. Not good enough to get a job though and only after struggling as a freelancer for 4 years did I finally get a regular job in a computer magazine where the requirement of English writing capability was not as much as the need to understand the IT business. Ironically, I had none. In fact, all I knew about IT in 1995 was two words – software and hardware.

I loved my work, accompanying responsibilities and my interest in computer was so great that I bought a computer for myself in late 1995. Internet, especially, looked like a whole new ocean of crests and troughs full of adventures, knowledge and exploration. My routine was: during the day, meet IT czars, cover IT news, report on the IT industry and during the night, almost till 4 am in the morning, get hung on the modem, connected through un-reliable telephone connections. But I juiced every bit out of it, downloading apps, searching the unseen world of humanity and its creations.

I learnt perhaps everything that I needed to know for a layman, about IT, Telecom, Internet, WWW, and so on. From 1995 to 2000, I got in touch with several publications abroad and wrote for them, earned dollars, in some cases getting as much as a dollar a word, the credit of which goes to none other than the Internet. I contributed to MIS Asia based in Singapore, IDG's Computerworld, Communications World, Fast Company, and Industry Standard. The Industry Standard was a weekly magazine that was launched by IDG to cover only the Internet and qualified this by the tagline "Weekly for the Internet Economy".

I used to send them a 200-word story almost every month regularly for more than 2 years. It was pure Internet play – explored the opportunity through the Internet, wrote about Internet developments in India and for the magazine meant for tracking the Internet and the economy it drove. The magazine was riding the hype of the Internet and the dotcom boom. The magazine which started as a 40-50 page weekly went up to as much as 150 pages, with more than 40 percent advertisement. Alas, the magazine no longer exists as before and survives only as an online email newsletter. For some reason, the Internet can become very addictive but if you have passion and use it for a good reason, it always gives back great results. Among others I also wrote for a German magazine, and some of the Arab world magazine translated my work to publish in Arabic. My communication cycle was round the clock and adrenalin levels were always high.

I can proudly say that from 1995 to 1997 as an IT Industry journalist, there would have hardly been any CEO whom I may not have interviewed and in the process not learnt something worthwhile. I owe a lot to them as they taught me many nuances of IT and the industry, even though the interaction was not so enlightening to them. My knowledge of the Internet, ICT and the IT industry became good enough to get a call from the Hindustan Times in 1997, asking me to head their Interactive Media (Internet) division, build a team and operationalise hindustantimes.com. In 1997, Hindustan Times had a frame based website with a very basic look and all that was being done was uploading of the newspaper content manually onto the web, well past midnight.

While we made the hindustantimes.com more versatile, dynamic, and interactive, it was ironical to note that hardly any of the correspondents and journalists in Hindustan Times were active on email. I remember, every day someone or the other from other cabins would walk into our cabin and ask for help to either create an email id or to play around with emails. However, the interest of the journalists in Internet and web started increasing when we started passing on to them huge amounts of feedback on their articles, most of them coming from NRIs. I must say that NRIs living in the US, UK and other European countries have been a great source of Internet proliferation in India. Being active users of the Internet and tools like chat, email and Skype, and so they pushed these on to their families which followed by word of mouth.

I was not content with just having hindustantimes.com and was being restricted to publishing the same stories from the print edition. I suggested to my boss Ashish Bagga, who was Vice President (Marketing), to allow us to create an independent portal as a separate entity. I was lucky to get the sanction and the credit goes to Ashish, as getting a separate fund allocation for creating a portal, from a traditional organisation like the Hindustan Times was not easy.

My division grew to 35 people, and we launched a full-fledged portal, called digitalHT.com. It was early 1998 and Hindustan times splashed full page ad about digitalHT.com and instantly reached millions. I got a call from Ajit Balakrishnan of Rediff.com. He simply said "good job." I was elated.1998 was the year when the dotcom boom was at its peak and it looked like everybody who was doing anything on the Internet would make big money and thus, investors were on the prowl. Hindustan Times was not immune and received interest from Chase Capital. And within a few weeks I came to know that they had invested about USD 9 million in digitalHT.com. Incidentally, in a meeting with prospective investors, the management decided not to involve even the person who had created the entity they were trading for. The management had started looking for outsiders to manage the new business, post finalisation of the investment.

I did not waste much time in waiting and watching. I quit, to start on the path of entrepreneurship with Sanjaya Gupta whose small company CRAC computers was a vendor to Hindustan Times and had helped a lot in building the backend of digitalHT.com. While digitalHT.com gradually became a company and was renamed go4i.com, graduating to a new plush office and burning investments by leaps and bound, Sanjaya and I formed 4CPlus to offer web development and content management systems solutions to publishing houses. From the late 1999 to 2003, we grew from a mere Rs. 4-5 million company to almost Rs. 35 to 40 million company. Our rich experience came through building websites for Outlook, Outlook Traveller, Rashtriya Sahara, Dainik Jagaran, Amar Ujala, Mid-Day, Tehelka, and many more.

On the side, I pursued my infatuation with dotcom and ran Inomy.com and a daily newsletter, tracking all the internet developments in India – it was popular but never made any money. The returns were in outreach and sharing of knowledge. Along with my friend Madanmohan Rao, we authored a title called *"Internet Economy of India"* where we tabulated that India had got an investment of about US$ 22 billion in the Internet and related economy. We received our share of publicity and started getting quoted as experts on the Internet, followed by expectations that we also knew what the hell "digital divide" was.

By 2002, I got thinking about the reality of – digital divide and realised that there is a huge opportunity for our country to exploit the Internet if we wish to leapfrog as a developed nation. As a result I created Digital Empowerment Foundation, sold my equity to my partner in 4Cplus and decided to walk the path of rural India in search of exploring how ICT, Internet and digital media could bring empowerment to masses. Taking a valuable lesson from the past and writing today through a platform called Digital Empowerment Foundation, a nine year old entity, there is a profound feeling of relevance of the Internet to the masses at large.

Starting as a technology and having grown into world's largest media and communication platform, the Internet has given birth to numerous innovative platforms – email, search engines, Google, Messengers, Skype, YouTube, Facebook, Wikipedia, Twitter, Blog, et al. They all are democratic, participative, equaliser, interactive and equalising opportunity platforms of content generation and consumption. Interestingly, all major innovations on the Internet are primarily free, for anything you need - from news to entertainment. Mahatma Gandhi once said, "It is not healthy to be a consumer of mass production but it is always good to be user of goods being produced by masses." Internet is a product made by the masses and consumed by the masses.

Internet also creates a system where the value of certification, value of systematic control of institutions are not seen as stringent, knowledge restrictive criteria as in traditional approaches. What it encourages is pure knowledge and pure capacity, pure intentions and participation. And linking Internet and its relevance in India, the largest democracy, we are sitting on one of the largest opportunity to exploit the Internet. How?

India has the largest population living in rural India and more than 50-60% of this is oral in nature. They cannot read nor write because they are illiterate and uneducated. Internet as a medium is audio-visual, it is oral, and so it directly relates to the people of India, who are oral in nature. It directly relates and suddenly converts the entire illiterate population of India into a literate population, as their knowledge richness can be captured orally.

Second, we have one of the largest numbers of micro, small and medium enterprises (MSMEs) in the country. Considering the economic side of the population, there exist 26 million MSMEs, but all of them are struggling at the bottom of the pyramid, unable to reach the market. They don't have the linkages, poor supply chain, poor knowledge about new design and market requirements. Internet can enable all of them to be online and exploit economics through multiple means. But incidentally, not even 10% of MSMEs are online, again a huge opportunity waiting to be explored.

We have one of the largest governing systems in our country through the Panchayats. The country has over 250,000 Panchayats, which cover all the villages. Incidentally, almost none of them are officially online though there are some examples from Kerala. One plain advantage is that when every Panchayat is online, transparency will increase, bottom up information and content will be popularised. Planning and development processes will get a great stimulus.

Again, who has the largest network of activities and information in our country other than the government? It is the NGOs. There are more than 3 million NGOs in India, most of them are not online and as most of them work at a grassroots level, they are sitting information repositories. Make them online and you have the widespread banks of information and content on India's diverse development and cultural ecosystem. While my field observations have gone stronger each day, the efforts at our end to address the same have been pushed through with programmes like, eNGO.in, ePanchayat.in and eMSME.in. All of these were launched with support from Ministry of Communications & IT (through National Internet Exchange of India).

The desire to see bigger doesn't end here. Similarly, can hope that each and every public health center in our country, mostly based at the village level, will go online, with real time data and information and equipped with ICT tools like video conferencing? Can we have every Police Station and Police Post online? Imagine having all schools, colleges, public and private institutions online, with all information and content flowing taking place on real time basis. It is certain that development, governance, planning and implementation will be more accurate, real time and quality oriented.

Of late, the Internet in India is having a new ally in the Right to Information Act, a legally bound policy step to feed the Indian public with real and true information. Considering RTI as an act under the legality of the Indian Constitution, it is imperative that each and every public servant, each and every government department, should be online including those who are dealing with the public money. Clauses in the RTI clearly say that each and every department, entity dealing with government should be open with their Information. And the Internet enables these institutions to act on those lines easily, make information public instead of following raw procedures in waiting for one to seek information. This culture of information facilitation through the Internet will and can usher in a more transparent and accountable governance and public service delivery system, whose great social and economic value is infinite.

In regard to this volume, it is a sequel to the *'Internet Economy of India'*, published in 2001. netch@kra is based on individual experience, ideas and practices of years. The book consists of analysis, narration, and commentary on critical aspects of Internet for development in India touching upon subject areas ranging from education to economic enterprise. The expert authors are drawn from academia, government, industry, civil society and individual experts havingvast pool of knowledge and experience in Information Communication Technology for Development for years. Even though many of the cases in the book are drawn from individual and practical experience, it highlights critical thoughts, ideas, actions and impact on how and why Internet is a great driving phenomena for a country of the size of India.

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Foreword

JYOTIRADITYA M. SCINDIA

Honourable Minister of State for Commerce
& Industry, Government of India

The present period in history is widely referred to as the Information Age - in contrast to the Agricultural and Industrial Ages that preceded it - because new capabilities for managing information are creating fundamental changes in the structure and functioning of society. Rapid growth in information processing and computer networking is ushering in a social and cultural revolution on the scope and magnitude of those brought about in ages past by the printing press and the steam engine. Information technologies are changing our patterns of social, commercial, and political interaction. These changes raise profound challenges and opportunities for people everywhere. It is a revolu-tionary period in history, with issues not yet fully understood, let alone resolved.

The evolution of Internet, the lifeline for any technological advancement now, has been nothing short of a revolution. With the advent of the Internet, we could conjure up the most unimaginable activities such as those of online rail and airline ticket reservation form the comforts of our homes to share trading and online shopping. Now with the advent of wireless, 3G technology and faster broadband connections, the aim should be to focus on providing better public infrastructure services and ensuring that we are all connected with the grass root level!

I congratulate Mr. Osama Manzar on his stupendous effort in compiling and editing "netch@kra - 15 Years of Internet in India". There has not been a similar effort before, which has aimed at chronicling the growth of Internet in India in the last 15 years. It becomes essential to chronicle the events in order to critically engage with the questions and concerns we are dealing with relating to the Information Technology era.

I extend my best wishes and good luck on this endeavor.

Prologue

N. Ravi Shanker

Internet: The Newest Colour in a Multicoloured Nation

The Internet has transformed India: a predominantly agrarian economy with a manufacturing capability has morphed itself into a composite mix of agro-industries-services economy. Internet Technology has played a central role in facilitating this transformation.

The IT-ITeS (Information Technology Enabled Services) Sector was almost negligible when the Internet made its foray into India on 15th of August 1995. It is today a $60 billion market and directly employs over 2.3 million Indians in this sector; almost triple that number is indirectly employed.

The growth of the IT economy has also spurred the process of urbanisation. This in turn has impacted socio-economic development across several regions of the country. The cities of Bangalore, Hyderabad and Pune have all scripted their own IT growth stories. They have emerged as major metros due to the magnetic attraction for large masses of educated youth all across the country. While the contribution of the IT sector to the national economy is now significant, the catalytic effect on youth is enormous. Young India now sports a "can do" attitude, and this is the defining element of Internet's impact.

Statistics are an indicator of how things change. Today, India has an Internet user population of 80 million. This indicates that there are over 16 million connections through which Internet is accessed. Broadband connections are a little over 8 million. Needless to say, this denotes a low Internet penetration for a population of over 1.2 billion.

The restraining factor for growth of Internet is the prohibitive cost of devices to a large mass of our population. The situation is sought to be redressed through setting up of public infrastructure in the form of Common Service Centres (CSCs) in all the Panchayats across the country, under the National e-Governance Programme (NeGP). Over 85,000 CSCs are now in place and the target is to set up 250,000 CSCs in a span of two to three years.

These CSCs which will dot the rural landscape are intended to provide citizen-centric services of various categories and also operate as e-Learning-cum-Telemedicine Centres. When fully operational, the CSCs may truly signify the death of distance and catalyse the rural economy by placing information at the command of the villages. An empowered villager can chart his or her own future.

Education adds lustre to a human being. With the advent of the Internet, IT education was in demand. Gone were the typewriting institutes of yore and in its place sprang up the IT institutes offering a variety of courses. IT education had such an allure that it changed the dynamics of school education. Computers came to the classes, albeit to a few and then came computer education for the masses, with DOEACC and several state entities offering quality courses at an affordable cost. This period also witnessed the growth of NIIT and APTECH and several other private institutes. There was both quantity and quality, and it kept pace with the fast changing needs of the industry.

IT in education was the logical outcome of growth in IT education. IT moved out of the clasp of the mathematics-electrical-electronics triad, to emerge as a ubiquitous subject. IT education moved from an elective to a core course and IT in education spurred demand for a networked educational environment. The programmes of the Government of India – National Knowledge Network, National Mission of Education through ICT and IT@Schools - are all in this genre.

When fully operational in tandem with one another, it would signify a countrywide classroom, taking quality education to the knowledge seekers. These programmes would democratise education and empower the beneficiaries. It augurs well for the emergence of India as a Knowledge Society.

Man is a social animal and by nature Indians are a gregarious people. We love to communicate and have happily adopted the latest 'social' tool - the mobile phone. This handy instrument has been a harbinger of change and has literally moved down the ladder from an object of desire to a necessity of modern life; 700 million plus phones and the numbers are growing. The mobile phone story says it all – India is forever connected, and the mobile user is an empowered individual.

Predominantly a voice device, with technological upgrades it can be the device to access the Internet. With 3G and BWA (Broadband Wireless Access) rollout, mobile Internet will be the order of the day. Three factors will determine its success – the cost of the smart phone device, the tariff of the telecom companies and the value added services that are on offer. Technology is the vehicle, commerce is the fuel, and society is the passenger. The mobile is poised for a new growth phase with the Internet driving it.

India is a multi-lingual society, and several hundred millions have missed the bus of education. How can the Internet and related technologies have an impact on their lives? It is time to reflect on this issue.

Multi-lingualisation is one answer to bridge the digital divide. Unless the anglo-centricism of the Internet and IT world is eased, the divide would persist. Inclusive growth must envelop all language groups as well as the disadvantaged section. There is a felt need to have a Voice Web, for those who are categorised as illiterate. The Voice Web can take them to the category of digital literates.

The Internet service providers and telecom companies have been major players in bringing technology to the masses. The lakhs of kilometers of optical fibres laid out by telecom companies are an infrastructure waiting to be exploited. The Internet Exchange Node points set up by NIXI (National Internet Exchange of India) have brought down the cost to consumers by enabling ISPs to peer locally. Nevertheless, there is a long road to travel to meet the greater demand, likely to come about by the spurt in traffic – e-Gov Applications, e-Education, Telemedicine, IPTV, VOIP/Internet Telephones, Mobile Internet, Voice Web, and so on.

While Shakespeare said "What's in a name"?, he may not say "What's in a domain name?" if he were around today. The domain name of the .com, .org or .in category are all in demand today and command a price. While there is a quantum growth in each of these categories, commercial value is attached to a domain name. Advertising and marketing have all undergone a paradigm change with the advent of the Internet and domain names thereof. Viral marketing is the name of the game and a naukri.com or yatra.com are frequently visited sites.

The engines of growth in the new world or cyber world are search engines. Today the Yahoo and Google search engines are household names. The steam engine defined the Industrial Revolution. The search engine defines the Information Revolution.

Social Networks are the 'in' thing and Facebook is the place to be in. It is a continuously updated network, which portrays the way a man behaves. "Elementary, my dear Watson", is what Sherlock Holmes may have quipped if he were around and on Facebook.

Bill Gates, Steve Jobs, Larry Page, Mark Zuckerberg, Tim Berners-Lee, Narayanan Murthy, Sabeer Bhatia are all legends of the IT world. The significant aspect of their lives is that many of them struck upon an idea when they were young and followed their instinct. Their success is a testimony to the fact that dreams come true. This is the magical effect of IT and the Internet. The world is the oyster for those who nurture an idea and want to give shape to it.

India has transformed but it has not changed. This is a land of contrasts – where centuries co-exist. The *sadhu* at the *sangam* with his mobile phone is the enduring image of the Mahakumbh.

The Ganga symbolises the ethos of India, which Pandit Jawaharlal Nehru described as "ever flowing, ever changing and yet ever the same". In the same vein, India has adopted the satellite as much as it venerates the candle lighted lamp; has taken a fancy to the optical fibre as much as it exhibits a taste for the handmade fibre.

"IT" may well stand for India Today or Incremental Transformation. Nothing can take away the fact that the Internet has transformed India and it has added one more hue to the rainbow that this nation is.

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Madanmohan Rao

India’s Internet Chronicles

Internet access in India has its roots in the Bulletin Board System (BBS) movement of the 1980s, and the government networks and services of ERNET, NIC, VSNL and STPI. On August 15, 1995, VSNL brought the Internet to consumers and citizens in India, and this book looks back over the last 15 years to trace some of the highlights of Internet growth, assess its impacts, and make recommendations for future growth and impacts.

Another phenomenon started just eight days after Internet launch in India, on August 23, 1995: the introduction of mobile telephony in India. Mobile Internet is a major emerging force in India’s online landscape, and next book specifically focuses on 15 years of mobile voice and data services in India. But that is getting ahead of the story a bit!

According to the Boston Consulting Group report The Internet’s New Billion, the total number of Internet users in the so-called BRIC nations — Brazil, Russia, India and China — and Indonesia will double to 1.2 billion by 2015. That will be three times the number in the United States and Japan combined, up from two times as much at the end of 2009.

While mobile phones with Internet access will aid growth, personal computers will double in the five countries to more than 920 million. India has some of the highest costs for PCs and the lowest availability, but consumers are already beginning to leapfrog to mobile devices to access the Internet. Whereas only four of the top websites in China are foreign, in India three quarters of the country’s most popular sites are owned by foreign companies.

According to the ITU's World Telecommunication/ICT Development Report 2010, nearly 90 per cent of the world's population is covered by a mobile cellular network. The number of Internet users has more than doubled since 2003, when the World Summit on the Information Society first met, and today more than 25 per cent of the world's population is using the Internet. While today 75 per cent of all households have a TV, only 25 per cent have Internet access. In the developing countries, home Internet penetration is as low as 12 per cent.

The number of websites, that are being registered under country domain names, is growing. Some of the highest 2005-2009 growth rates in terms of newly registered domain names were found in India (.in), Russia (.ru) and China (.cn).

India is one of the largest Internet markets in the world, but has a unique mix of digital excellence along with digital divide. From e-commerce and digital news to gaming and e-government, India has changed a lot over the last 15 years. However, beneath much of the quantitative figures, there is a need for deeper understanding of the impact of the Internet in India along a broader framework which covers connectivity, content, community, capacity, commerce, cooperation, capital and culture.

Much existing research on the Internet in India focuses on market-centric consumer and business surveys. This research project addresses a number of deeper critical questions, drawing on the framework of Table 1. What role does the Internet play in 21st century business and social patterns? How are consumers and citizens reacting to and shaping the unfolding Internet environment in India? How are Indian industry and civil society organisations creating a better Internet for all? What are the emerging recommendations for multiple stakeholders to better partner in creating the appropriate ecosystems?

Growth and Context

Let us begin with the numbers, as is the case when describing digital markets in countries the size of a billion people, such as India and China.

According to industry figures, India has 40 million PCs, 70 million Internet connections, and 10 million broadband Internet users. India has close to 800 million telecom connections, and overall teledensity is 65 per cent.

There are close to 750 million mobile subscribers. India took 25 years after independence to reach the 1 million telecom user mark; today India adds close to 15 million mobile users per month. Only 2.5 million laptops were sold in India in all of 2010, as compared to 15 million handsets per month.

130 million households in India have TV, with 700 million viewers on a daily basis. CableTV has outstripped dialup as a means of Internet access. But broadband Internet penetration in India is only 0.57 per cent.

70 per cent of India's population lives in its 594,000 villages, and 60 per cent of its population is engaged in agricultural activities. Urban teledensity is 135 per cent but rural teledensity is only 25 per cent.

Rural capital expenditure (CapEx) for mobile operators is upto 4 times that of urban CapEx; rural operational expenditure (OpEx) is 3 times that of urban OpEx. Rural broadband users account for only 5 per cent of total broadband subscribers in India. According to an IMRB/IAMAI survey, 84 per cent of villagers in India are not aware of the Internet.

According to Robindra Mangtani, Senior Director at GSMA, there will be more smartphones than PCs in the world by 2013. In 2011, over 85 per cent of handsets will be able to access the mobile Web. The mobile telecom industry can create 327,000 jobs in India and a US$ 68 billion industry by 2020.

India has 16 major languages and 1,650 dialects, but the dominant language on India's Internet is English. One fourth of the Indian population resides in slums. Half (53.6 per cent) of the houses are without drainage, majority (63.6 per cent) of households do not have toilet facilities and only one-third (36.1 per cent) have bathroom facility within the house. 44 percent of the households in India do not have access to electricity.

Table 1: The "8 Cs" of the Internet Economy

	Internet as an instrument	Internet as an industry
Connectivity	How affordable and widespread is the Internet for the common citizen?	Does the country have manufacturing industries for Internet appliances and communications gear?
Content	Is there useful online content (foreign and local) for citizens to use in their daily lives?	Is content being generated in local languages and localised interfaces? Is this being accessed/used abroad?
Community	Are there online/offline forums where citizens can discuss and mobilise around Internet issues?	Is the country a hub of discussion and thought-leadership forums for the worldwide Internet industry?
Commerce	Is there infrastructure (tech, legal) for e-commerce for citizens, businesses and government? How much commerce is transacted electronically?	Does the country have indigenous e-commerce technology and services? Are these being exported?
Capacity	Do citizens and organisations have the human resources capacity (tech, managerial, design, legal) to learn about the Internet and harness it for daily use?	Does the country have the human resources capacity (tech, managerial, design, legal) to create and export Internet technologies, and set standards?
Culture	Is there a forward-looking, open, progressive culture at the level of policymakers, businesses, educators, citizens and the media in opening up access to the Internet? Or is there nervousness and phobia?	Are there techies, entrepreneurs and managers pro-active and savvy enough to create local Internet companies and take them global?
Cooperation	Is there adequate cooperation between citizens, businesses, academics, NGOs and policymakers to create a favourable climate for using the Internet?	Is there a favourable regulatory environment in the country for creating Internet companies, M&A activity, and links with the diaspora population?
Capital	Are there enough financial resources to invest in local Internet infrastructure and startups? What is the level of FDI?	Is there a domestic venture capital industry; are they investing abroad as well? How many international players are active in the local private equity market? Are there stock markets for public listing?

Source: Author

There are four kinds of Indians: global Indians (1 million households), aspiring Indians (40 million households), struggling Indians (domestic helps: 110 million households), and destitute Indians (40 million households).

In this diverse and lopsided demographic mix, the Internet has certainly helped globalise urban English-speaking Indians via social media and online services, and to a lesser extent the "aspiring India" households. The real challenge and opportunity – and duty for us all – is to bring the benefits of Internet and digital empowerment to the "struggling" households as well.

Research and Methodology

This book is based on primary and secondary research sources. The secondary research draws on existing literature and Internet reports published about India. The primary research draws on a component framework and structured questionnaire used over the last 10 years of the Asia-Pacific Internet Handbook series. This was shared with contributors of the individual chapters of the book, and the resulting material has been edited compiled into this authoritative book.

The project also uses a blend of clustering analysis of recent research and news reports in the region, interviews and focus group discussions with Internet experts, and in-depth case histories by Internet pioneers and entrepreneurs.

A number of studies have addressed the growth of the Internet, its constituent cultures and ecosystems, and national impacts. One of the early comprehensive overviews of the global evolution of bulletin-board systems, online services and the Internet was by John Quarterman (1990).

"Technological systems are socially produced. The Internet is, above all else, a cultural creation. The Internet culture today is characterised by a four-layer structure: the techno-meritocratic culture, the hacker culture, the virtual communitarian culture, and the entrepreneurial culture," according to Internet scholar Manuel Castells. These sets of cultures have spurred the open source movement, the gift economy, cyberpolitics, virtual communities, and new venture capitalists (Castells 2001).

"The culture of the Internet is made up of a technocratic belief in the progress of humans through technology, enacted by communities of hackers thriving on free and open technological creativity, embedded in virtual networks aimed at reinventing society, and materialised by money-driven entrepreneurs into the workings of the new economy," Castells succinctly sums up.

Uses of online services and the Internet by activists working for social change are documented as far back as 1989 by John Downing ("Computers for Political Change"), 1990 by Graham Lane ("Communications for Progress") and 1993 by Howard Frederick ("Global Communications and International Relations").

The impact of telecom and data services on development began to be chronicled by researchers such as Lynne Gallagher (Gallagher 1999), and some early pioneering work on community telecentres was conducted by Michael Gurstein (Gurstein 2000).

The impact of successive waves of new media transformation on earlier media are classified by Roger Fidler (Fidler 1997). Mobile Internet is an emerging force in India, but its first major success story in the world was in Japan's iMode (Funk 2001).

Some of the earliest pan-Asian studies of the Internet were conducted by the Asian Media and Information Communication Centre (Ramanathan and Becker, 2001), and are also captured in the Asia-Pacific Internet Handbook Series (Rao, 2004; Rao, 2003; Rao, 2002). Singhal and Rogers 01) (2001) published one of the early books documenting the rise of India's digital media along with traditional media, and Bhatnagar and Schware (2000) documented some of the early ICT4D examples in India.

Studies of the huge Internet economies of India and China have been conducted by a number of authors (Rao, Manzar and Ahmed, 2001; Zeff, 2002). Early examples of e-government and local entrepreneurship in India were the Gyandoot model (Rajora 2002).

Primary Research: Findings of the Contributors

29 contributors have conducted extensive research and drawn on their own professional and personal experiences to weave a rich and diverse set of narratives in this

Manish Dalal has observed that in just 15 years, the Internet has changed the social and economic fabric of much of the world - we cannot imagine life without the Internet today! In 1985, the first .com domain name was registered, and in 2010, .com celebrated its 25th anniversary. In 1996, India's first .com domain name went live: Rediff.com was registered

Table 2: ICT Applications and Benefits

	Applications	Benefits
Healthcare	- Telemedicine (audio/image transmis sion, collaboration eg. for radiology) - Digital publication of medical re search - Outsourcing of services	- Increased productivity, reduced travel costs - Broader service reach for experts - More responsive healthcare services for citizens
Agriculture	- GIS systems for planning - Tele-education, scientific databases - Telecentres, information services for pricing	- More awareness of innovative approaches - Improved food production - Seasonal planning, risk mitigation
Education	- Distance education - Teacher training - Indigenous education	- Improved visualisation skills - Up-to-date course materials accessible from remote areas - Cost savings, on-demand education
Business	- e-Banking, e-stockbroking - Logistics management - Global trading platforms	- Efficiency, less delays - Lower costs of marketing - Global exposure
Media/cultural industries	- Digital newsrooms - Archival technology, methodologies, standards - New media formats	- More responsive news cycles - Preservation of local cultural forms via archives, interactive CD-ROMs and Web sites - Global projection of local media, culture
Environment	- GIS mapping - Networking of environmental activists - Databases of crop patterns	- Better management of resources - Planning for disaster aversion - Improved awareness among activists
Governance	- Online information for citizens, businesses, NGOs - Planning and management of trans portation - Simplified procedures for interna tional business	- Less wastage of citizens' time, better access to crucial information - Improved accountability of govern ment officials - Simplified tax procedures for business
Urban develop-ment	- Urban planning, service delivery - Public telecom, Internet facilities - Urban telecentres	- Shared infrastructure for multiple sectors - Better coordination of digging up roads! - Urban telecentres
Rural develop-ment	- Rural community networks, public call office - Rural tourism - Healthcare	- Rural community networks become economic drivers - New employment opportunities - Access to government services from remote locations

Source: Rao and Raman (2009)

and India was on the .com map. Today, the mobile phone forms the largest piece in the digital fabric in India, and far outstrips PC penetration in rural India.

Rajnesh Singh traces the sweeping growth of the Internet protocol, Web, and cloud computing. It is expected that the global Internet user base will cross the two billion mark sometime in 2011, and the number of mobile broadband users will reach a billion. But as compared with China's 420 million Internet users and 364 million broadband users, India’s 80 million Internet users and 10 million broadband users are nothing short of embarrassing. India's GDP could grow by Rs. 162 billion (US$ 3.6 billion) for every percentage point increase in mobile broadband penetration. The Internet is thus a critical component to India’s socio-economic development. For the developing world, cloud computing can be the great equaliser.

Srinivasan Ramani documents the early growth of the Internet in India via ERNET. It traces its roots to data communication initiatives at the National Centre for Software Development and Computing Techniques (NCSDCT). Eight institutions (including IITs, NCST, DOE) cooperated to create the nationwide ERNET in the early 1990s, to further academic R&D. More significant than the technology that ERNET brought to India, its critical contribution was in promoting the cooperative culture among national institutions. The entry of VSNL was a turning point for software companies and other non-academic users in India, as well as the setting up of specialised Internet access facilities by the Software Technology Parks.

T.H. Chowdary traces how some of the early monopolistic and restrictive telecom policies of the past were overcome. The end to monopoly ushered in by the government in 1998 led to licensing of private ISPs, establishment of numerous Internet Cafes for public use, and later on approval of VoIP services. Chowdary also cautions that in the absence of international regulations and treaties relating to use of Internet, crimes are multiplying. Emerging challenges include ensuring affordable and ubiquitous broadband, and Internet security.

Amitabh Singhal recounts how the Indian Internet industry worked together over the past 15 years. The Policy Building Process (PDP) by the industry goes back to the early years of VSAT, VAS and email messaging services in the early 1990s. The Email and Internet Service Providers Association (EISPAI) was set up in 1994-95. The TRAI Act of 1997 resulted in the establishment of an independent telecom regulator. EISPAI made its formal transition to becoming ISPAI which was formally incorporated in 1998. Key contributions included opening up of private investment in building submarine gateways, and advancing the ending of VSNL’s guaranteed monopoly status. The National Internet Exchange of India (NIXI) became operational in 2003.

Suchit Nanda traces the grassroots growth of the bulletin-board system (BBS) movement in India, and its absorption into the global Internet. From analog phone lines and hobbyist communities to commercial licensing and social movements, India’s BBS pioneers have dabbled in a range of technologies and applications; some of them eventually became ISPs. Decades later, today’s broadband movement also shares some of the same early concerns of the BBS movement: overcoming digital divides, delivering appropriate content for a range of users, and fostering a sense of community.

B.G. Mahesh traces the growth of the Internet as a popular medium among NRIs in the 1980s and 1990s, and the Internet content boom in India after 1995. From email and Web to mobile and social media, the “killer app” of new media has evolved. The dotcom bust separated the serious players from the rest of the pack. Consumer social media (eg. bloggers) are booming, but corporates and government agencies need to embrace social media more proactively. Though there is much hype about the mobile Internet, PC/laptop-based Internet must not be ignored. Investors and startups need to work together to add scale to India’s Internet industry. The Internet industry in India will grow a lot faster if the advertising world also accepts this as a serious medium.

Tracing the birth, growth and acquisition of the IndiaWorld portal – the largest Internet deal in India's dotcom boom – **Rajesh Jain** traces its growth from a single aggregation site to a number of vertical sites. He offers several useful tips for entrepreneurs (eg. it is important to know not just when to enter, but also when to exit!). Today, the startup scene in India's digital space is buzzing again, thanks to social media and mobile phones. There are numerous opportunities emerging in "app" space and micropayments.

D.K. Jain outlines the key role ICTs can play in enhancing Panchayati Raj Institutions in India (PRIs). PRIs function at the village, intermediate (block) and district level. 250,000 Panchayats form the core of the governance structure in rural India. Citizen participation in PRIs would be more meaningful if people had timely access to information. Computerisation and IT enablement of government functioning has received a high impetus with the implementation of the National e-Governance Programme. One of the biggest constraints in broadband penetration is the lack of right applications and services.

Ashis Sanyal argues that ICTs are an effective enabler for the development paradigm. ICTs can help deliver SMART (Simple, Moral, Accountable, Responsive, Transparent) government services to citizens. In addition to setting up Common Services Centres (CSCs), the Government of India is creating State Data Centers (SDCs) and IP-based converged statewide area networks (SWANs) connecting all government offices. `Single window' services of MPonline in Madhya Pradesh, eSeva in Andhra Pradesh, FRIENDS in Kerala, and eMitra in Rajasthan are some success stories at the state level. There is a strong need for building the internal capacity in Village Level Entrepreneurs (VLEs).

Venkataraman Balaji highlights the challenges and some of the progress made in providing Internet-accessible production resources for farmers in India. ICTs can assist in providing information on the "3 Ms" of farming (materials, meteorology, markets), but a significant digital gap still exists in production content and services. Village telecentres and kiosks are only one part of the solution; institutional support, broad-based government initiatives and university participation are also essential. Some success stories such as those of Tamil Nadu Agricultural University are emerging in India, as well as Agropedia, aAQUA, DEAL and KISSAN-Kerala.

Usha Reddi provides in-depth perspectives of the Internet as a harbinger of the Information Society in India, especially from the point of view of technology in education and learning. From the SITE television experiment and Countrywide Classroom to Gyan Darshan and EduSat, waves of new media have enhanced education. Challenges arise in precise measurement of e-leaning outcomes, adapting pedagogic and administrative frameworks, and overcoming the digital divide.

S. Sadagopan traces the impact of commercial Internet and mobile services over the last 15 years in the educational institutes of India. The Internet has deeply impacted youth and the 4L's of Learning: Lecture, Library, Laboratory and Life. Course video lectures address the needs of undergraduate engineering colleges in the form of NPTEL. Availability of laptops and Wi-Fi on campuses have improved the student's learning experience considerably. INDEST (Indian Digital Library in Engineering Science & Technology) has "levelled the field" for Indian researchers.

Taking on the perspective of an economist, **Amir Ullah Khan** argues that India's competitive advantage today clearly lies in the strengths of its human capital. India has established one of the finest education systems in the developing world, with some institutions as global stars (IIT, IIM, IISc, IRMA, CSIR, ISRO, BARC). The demand for employment in India in the year 2011 is estimated to grow to 380 million. India's youth have a lot to offer: energy, enthusiasm, and above all the expertise to help bridge the digital divide. What the Internet offers is a huge advantage to an emerging economy with scarce resources and a large constituency.

Table 3: UN Millennium Development Goals and ICT Indicators

	MDG	ICT4D Indicators
1	Eradicate extreme hunger and poverty	ICT initiatives directly targeted at poverty elimination, poverty-reduction strategies that include ICTs
2	Achieve universal primary education	ICT access in schools, percentage of teachers trained in ICTs, learning materials in digital form in local languages
3	Promote gender equality and empower women	ICT literacy among girls, role of women in ICT policymaking, availability of training of female workers in ICTs
4	Reduce child mortality; Improve maternal health; Combat HIV/AIDS, malaria and other diseases	Campaigns to sensitise population via ICTs, ICT usage in health institutions, health sector allotments in national ICT plans
5	Ensure environmental sustainability	Education/awareness campaigns using ICTs, ICT initiatives to reduce consumption of energy, water and other essential resources
6	Develop a global partnership for development	Number of companies and people employed in ICT sector, number of web pages in local languages, ICT penetration, competitiveness of local markets

Source: Rao and Raman (2009)

Building on NASSCOM's sentiments, **Ganesh Natarajan** advocates the importance of "Roti, Kapda, Makaan, Bijli and Bandwidth" for India. Despite some early failed experiments in e-learning, content repurposing will become a practice at the best academic institutions. Gaming is now becoming an integral part of e-learning. Natarajan proposes an Internet-based Open Learning environment and an Innovation University for India that is built on three fundamental precepts – a learner centric model of education, employable and contemporary skills and conceptual grounding in the subject area that is being covered.

Mira K Desai provides an in-depth analysis of the school and college systems and literacy situation in India. Only 64 percent of Indians are literate. Having 70 percent of India's population below 34 years of age makes education an essential service. A number of educational services portals have sprung up to address this issue: Minglebox.com, 24X7guru.com, Extramarks.com, 100percentile.com, SmartClassOnline.com, WebDunia.com, Prabhasakshi.com, and the Ministry of HRDs own Sakshat (www.sakshat.ac.in). Indian universities and colleges are now able to access journals online via INFLIBNET.

Arun Jethmalani explains that for millions of Indians, the Internet has indeed changed our lives – even if in ways we never imagined. The real Internet story in India is not about the number of billionaires, but the all-pervasive impact it is having on our personal lives, and on businesses like IT, BPO and financial services. Nearly 6 million retail customers are registered on NSE and the trading value exceeds 10 per cent of all traded volumes. But Net usage and commerce cannot increase unless more people have a "personal" device to access the Net. The opportunity for mobile banking is unparalleled.

Sunil Saxena explains that the arrival of the Internet in India was a quiet arrival. Only in the late 1990s did major news providers set up a Web presence. A new group of media professionals has emerged, who are Web savvy. Broadband access gave a new lease of life to television websites. Many mainstream media in India encourage their staff members to write blogs. Many media houses now have their own dedicated short code for SMS news updates.

Internet ad spends need to increase in India. Emerging frontiers include integration of tablet devices with mobile phones, and the rise of video content.

Keval J Kumar shows how the Internet and mobile phone have opened up new channels for the news and entertainment industries – but also been used by local and cross-border terrorists. The rise of the Internet has given rise to a new language, and to new meanings for familiar words and phrases. Keval urges for critical pedagogy approaches in areas like checking for credibility of sources on the Net, use of advertorials, and dealing with spam. The Internet has become an invaluable resource for both lecturers and students; how it is made use of by teachers will depend on the strategies of their media pedagogy.

According to **Alwyn Didar Singh**, no country rode the technology boom in the United States more spectacularly than India, which created an $8 billion computer software industry from scratch in the last two decades. Gains via e-commerce for domestic and international markets will come from the appropriate legal and financial framework, and the political and business environment. An estimated 40 per cent of e-commerce is accounted for by the travel sector. Indian Railways ticketing alone is said to account for a quarter of India's e-commerce industry.

Arjun Kalyanpur discusses the potential of telemedicine in India, in particular teleradiology services for patients in global and domestic markets. The growth of the private hospitals, broadband Internet and the latest imaging technologies, coupled with the BPO boom in India, are opening up new opportunities. Internet connectivity must be improved in the remote hinterland, where teleradiology services are most needed, and can make the greatest impact. Internet utilisation in Indian medical schools should also increase. Healthcare IT development is another growth area with tremendous potential.

Frederick Noronha provides case studies of two popular email-based news and discussion services, GoaNet and BytesForAll, started in the days of humble dialup modems. The Internet has opened up new work possibilities for freelancers and created local and global discussion forums – but also opened the door to spam and porn. The 'gift economy' of the Internet is an unparalleled asset, but calls for precious time and energy of volunteers. BytesForAll shares ICT4D news in South Asia and has helped build discussion and cooperation between a number of activists in the region.

Nirmal Jain claims that no other industry in India has been impacted by the Internet as much as financial services, and within that, stock markets. Ninety per cent of the stock market's size in India came into existence only in the last 15 years, powered in part by Internet revolution. The Internet has helped create new players like IndiaInfoline, and democratised equity trading for the common man in the stock market. For further success, India's broadband penetration needs to increase, especially in rural areas.

Based on their Drishtee network of kiosks, **Satyan Mishra** and **Nitin Gachhayat** focus on the intricate web of relationships and services that need to be in place in order to successfully support Internet access models in rural India. Villagers in India are highly reliant on a host of government programs and services that provide them access to basic necessities of life. There is a dual need for providing access to information and services at the village level while generating viable employment opportunities. There can be no better way to spread IT than by creating micro-enterprises around the technology.

Pavan Duggal traces the growth of cyberlaws and e-commerce laws in India, starting with the Information Technology Act, 2000. It made email a valid and legal form of communication in our country, authorised the use of digital signatures, and recognised corporate electronic records. The Information Technology (Amendment) Act, 2008 was implemented in 2009, and expanded the domain to all kinds of communication devices including mobile phones. There is still room for improvement in areas like spam legislation, privacy, and punishment for violators. Emerging frontiers include the Unique Identification Number, and legal support for its usage.

Sunny Ghosh and **Sanjukt Saha** maintain that the Internet is a key player in uncorking innovation, the new "iron ore" of India's future. The need of the hour for India is more capital support systems and entrepreneurial incubation centres. A new range of innovators is moving into hardware and product space, and creating new frameworks beyond the Jugaad model. Cloud computing will not just provide productivity savings for existing organisations but create a new crop of Internet entrepreneurs, including social business innovators. Broadband Internet links now represent the new waterways of India.

Patrick Kane predicts that the Internet will reach 2 billion users in a fraction of the time it took to reach the first billion users. Emerging trends include the rise of online video; mobile media; and advancements in machine-to-machine interactions. Infrastructure operators have to operate at the leading edge of growth as well as cybersecurity. With the final remaining linguistic barriers associated with DNS (Domain Name System) falling away, Indian entrepreneurs and innovators will tap into new audiences and engineer new business models.

Vijay Shekar Sharma traces the growth of Internet opportunities from the view of an entrepreneur involved from the early days of ERNET and VSNL's Shell Account. From Web design to animation, and these days from social media to mobile Internet, the Internet is opening up new vistas for Indian youth and innovators. Useful tips are provided for entrepreneurs in revenue share agreements and exit strategies. India has a terrific opportunity now to not just be a follower but world leader in the wireless and mobile

Internet.

Wolfgang Kleinwächter providers a sweeping overview of Internet governance. The Internet is now in the Top Ten list of issues on the global policy agenda, for everything ranging from domain names and access models to intellectual property and freedom of expression. One of the biggest opportunities of the Internet Governance Forum (IGF) is to stimulate informal and formal arrangements for sustainable Internet Governance solutions, to function as a laboratory, a clearinghouse and a watchdog and to develop a power of inspiration. Countries like India can play a key role in this arena.

Findings and Future Scenarios

In each of the various sectors – education, health, agriculture, financial services, media and government services – the primary researchers above highlight trends and detailed recommendations for the future growth of a broadbased and equitable Internet ecosystem in India.

In separate interviews conducted in the course of research for this book, Nibha Vyas Bhandari of Text100 shows how the Internet has significantly benefited the public relations (PR) industry in India. The ubiquity of email was a milestone in how information was shared with the media and other key audiences - a godsend for PR executives who earlier used to fax or hand deliver press releases and other documents to the press. The Internet opened a virtual goldmine of research possibilities for PR executives, allowing them to better understand their client's industry and environment.

The rise and growing significance of social media will result in firms using social tools and platforms to reach out to their clients' key audiences directly; already, Twitter is emerging as a powerful tool to shape and mobilise public opinion. The widespread prevalence of BlackBerry and other smart phones among PR executives will increase operational efficiencies and service excellence. There will be a merging or at least blurring of lines between only-bloggers and only-journalists in India.

Media consultant Arun Katiyar explains that the Internet can truly integrate India, but the Indian language gap on the Internet should be urgently addressed. On the telecom front, regulators should ensure that big incumbent players should not squeeze out promising emerging startups and services. On the device front, major design innovations will appear on touchscreen interfaces, which will be more easily usable by rural and semi-literate audiences as well. Smartphones will become the "new normal phone."

On the cognition and education front, the Internet has reduced the need for memorisation, thus opening up the mind for other more demanding tasks. The Internet and mobile phones will speed up business velocity even more. At the same time, it should be made mandatory for businesses to set specific goals on reducing their carbon footprint via using ICTs.

Table 4: ICT4D Trends

Parameter	**ICT4D Trends**
Connectivity	- $100 laptop, $10 basic phone, $50 smartphone - Broadband wireless/mobile: WiMax, WiBro - Internet: IPv6 - VoIP - Open source code, platforms - Smart cards
Content	- Open content and narrative models: Wiki, blogs (Web 2.0) - Search, mining, translation - Standards (eg for e-learning; electronic product codes)
Community	- Knowledge networking forums - Telecentre associations, Telecottage industries, community knowledge centres
Commerce	- Online P2P payment - Mobile remittances
Capacity	- Design, business, social entrepreneurship - Security, risk management
Culture	- Acceptance of ICT4D as 'must have,' not just 'nice to have' - Frameworks and discourse on ICT4D (eg. 'bottom of the pyramid,' 'next billion') - Niche events, inclusion of ICT4D
Cooperation	- Public-private partnerships - Multi-stakeholder initiatives
Capital	- FDI into mobile operators of developing countries - 'Bottom of the pyramid' venture capitalists, social business investors

A key lesson, though, is that Internet success in India depends on an offline on-the-ground presence as much as an online presence (for instance, in supply chain management), according to Sanjay Anandram, CEO of venture capital firm JumpStartUp.

The Internet is no longer seen as a fad, but as something very much here to stay and be nurtured. The emergence of civil society online to tackle problems like government corruption is a welcome sign. Internet usage and impacts in the smaller towns of India is a harbinger of bigger things to come.

In summary, for Internet access to truly make an impact on urban and rural India, there are at least eight key success factors: appropriate and affordable technologies, funding and pricing options, market demand for online services, a range of stakeholders, research and benchmarking of best practices, consumer and citizen-friendly regulation, successful models for public-private-people partnerships, and increased awareness of Internet benefits and risks.

As described in Table 5, India has made significant progress on the Internet front as compared to other developing countries, but the full potential is just beginning to be tapped. To take access and content reach beyond the footprint of the mainstream ICT market, multiple stakeholders need to align themselves with the development agenda. Care should be taken to avoid the "IT first" or "IT only" traps, and connectivity initiatives should be coupled with content and services. In designing connectivity infrastructure and services, adequate attention needs to be paid to back-end integration of processes and tools, and not just pretty front-ends.

Creativity will be needed in devising a range of user-friendly ICT tools for village users, including community radio (eg. cable audio, handhelds), individual info-kiosks, and networked PCs. Solutions like solar energy can be used to address problems related to lack of electricity.

Local language content in text and video form will be key for increased Internet uptake. Indian content on Wikipedia as measured in terms of number of articles per language is growing rapidly, eg. Gujarati (15,000 articles), Marathi (30,000 articles), Urdu (15,000 articles), Malayalam (15,000 articles), and Tamil (25,000 articles) in 2010. There are 20 Indic languages Wikipedias and another 20 are in incubation.

The first Indian has now joined the Board of Trustees of WikiMedia, and an Indian wikipedian has been elected as Steward. The WikiMedia Foundation announced their focus of India as a geography to grow Wikipedia, and an India chapters has been formed.

For instance, for extending telecom services to underserved areas and communities, India's Universal Service Obligation Fund (USOF) has raised US $3 billion; $2.79 billion have already been disbursed as of December 2010, according to Archana Gulati, joint administrator of USOF (www.usof.gov.in).

ICT4D should focus not just on connectivity, but also content and e-services and their impact. This involves renewable energy installations, gender initiatives, and projects for disabled citizens as well. It is important not to just "throw" content at end-users but assess their needs and empower them to generate their own content.

Awards and competitions such as the annual Manthan Awards (www.ManthanAward.org) and mBillionth Awards (www.mBillionth.in) have brought increased recognition to a number of innovative Internet-powered startups and services in India, such as Harva (www.harva.co.in), Source Pilani (www.sourcepilani.com) and EkGaon (www.ekgaon.com). More such research and awards at the state and village level will bring about further best practices and benchmarking in improving online services and access across India.

When we put together an updated edition of this book after another 10 or 15 years, we certainly hope the situation in India will have improved dramatically!

But why wait for another 15 years? We sincerely hope this book helps bring to our readers an even greater sense of urgency to bring about replicability and scale of Internet success stories across the length, breadth, depths and heights of India.

My Internet Journey: Personal Reflections

I myself first stumbled upon the power of the Internet as a technology, information and community platform during my grad school days in the US at the University of Massachusetts in the mid-1980s, immediately after my undergrad education at the Indian Institute of Technology in Bombay. We used only mainframes and punch cards in batch-processing mode during computer science courses in those days in India. And till I was 21 years old we had no telephone at home in Poona (now Pune) where I grew up; my college hostel in Bombay had only one phone booth for 250+ students.

Table 5: Classification of Asia-Pacific Information Societies based on the "8 Cs" framework

Type	Characteristics	Examples
Restrictive	- ICT infrastructure is very limited - ICT usage is tightly controlled by government - Awareness of ICT among general population is very low	North Korea
Embryonic	- ICT infrastructure is just being rolled out - Donor agencies are active in funding and providing human resources - Large amount of ICT activity is driven by diaspora, NGOs	Afghanistan, East Timor
Emerging	- Internet infrastructure exists in urban areas - Local capacities exist for ICTs, policy bodies are being formed - Widespread digital divide exists, e-commerce is not yet widely prevalent	Nepal, Bangladesh
Negotiating	- Widespread Internet/wireless infrastructure exists - Local capacities and markets exist for ICTs, e-commerce - Government is "negotiating" benefits and challenges of new media; authorities exercise strong control over online content, search engines; political and cultural censorship of Internet is practised	China
Intermediate	- Sizeable markets for Internet, e-commerce, wireless exist - Digital divide is still an issue, donor agencies are active - Political climate is generally free of censorship for traditional and online media	India, Philippines
Mature	- Large-scale penetration of Internet, wireless - Mature business models for online content - Political climate is generally free of censorship for traditional and online media	Australia, New Zealand
Advanced	- Large-scale penetration of broadband and wireless Internet (including 2.5G, 3G) - Political climate is generally free of censorship for traditional and online media - Some ICT companies are major players in global markets; wireless content models are being exported	Japan, South Korea

Source: Rao and Raman (2009)

But in the US, international academics and students were creatively using email digests and the Usenet forum to circulate news and opinion about developments in their home countries and their new host countries, especially during events like the Gulf War. As a student journalist in the US, I used to read out excerpts from these news items on the radio and even conduct interviews via email discussion lists to get opinions from other Netizens for my stories.

I realised that a profound change was happening to the global media landscape. I switched from the computer science department to communications in 1992, and researched the online news environments in the US and developing countries like Brasil as part of my dissertation on the impact of computer networks on international information flows.

By then the World Wide Web had taken off and the Internet was being launched as a commercial and public medium around the world, starting off in 1995. I returned to India in 1996 as an Internet consultant and writer, first joining Rajesh Jain and his IndiaWorld team in Mumbai and then Pradeep Kar and his Microland/PlanetAsia team in Bangalore.

My parents in Pune bought a PC and I taught them how to use email so they could stay in touch with my brother and I (today they use Skype also). In those days of dialup we all had to be quick in using the Internet because it would use up the telephone line and others could not call us at home. I got my first cellphone in 1998 and my first laptop in 2000. Soon I began to notice that business cards would have not just a phone and fax number but also an email id and a URL (and these days Twitter handles also) – but I also noticed that my relatives in rural areas had no clue at all about what this Internet thing was.

My journeys around the world exposed me first hand to the spectacular dotcom boom and bust, and the broader undercurrents of long-term Internet impacts on media, commerce, government, education, and civil society. I wrote about these in Express Computer and the Economic Times, as well as the US-based portal InternetNews.com and the global Internet Society's magazine "On the Internet." I teamed up later with Osama Manzar, whom I first met when I interviewed him for the portal IndiaLine, and we co-authored the book "The Internet Economy of India 2001.

I then launched the "Asia-Pacific Internet Handbook" series to chronicle and analyse Internet and ICT4D developments across the region (Episode IV: Emerging Powerhouses; Episode V: News Media and New Media; Episode VI: Asia Unplugged – The Mobile and Wireless Boom). It is fitting that ten years later I have come back in a full spiral to do one more book with Osama Manzar on the Internet in India, this time called netch@kra!

Resources

Bhatnagar, Subhash and Schware, Robert (2000). Information and Communication Technology in Development: Cases from India. New Delhi: Sage Publications.

Castells, Manuel (2001). The Internet Galaxy: Reflections on the Internet, Business, and Society. Ocford: Oxford University Press.

Downing, John (1989). Computers for Political Change: PeaceNet and Public Data Access. Journal of Communication, Summer 1989.

Fidler, Roger (1997). Mediamorphosis: Understanding New Media. California: Pine Forge Press.

Frederick, Howard (1993). Global Communications and International Relations. Belmont, California: Wadsworth Publishing Company.

Funk, Jeffrey Lee (2001). The Mobile Internet: How Japan Dialed Up And The West Disconnected. Bermuda: ISI Publications.

Gallagher, Lynne and Turnbull, George (1999). Telecommunications in Action. London: The Regency Foundation.

Gurstein, Michael (2000). Community Informatics: Enabling Communities with Information and Communications Technologies. London: Idea Group Publishing.

Lane, Graham (1990). Communications for Progress: A Guide to International E-mail. London, United Kingdom: CIIR.

Manzar, Osama; Rao, Madanmohan, and Ahmad, Tufail: 2001. The Internet Economy of India. New Delhi: INOMY Publications.

Quarterman, John (1990). The Matrix: Computer Networks and Conferencing Systems Worldwide. Digital Press.

Rajora, Rajesh (2002). Bridging the Digital Divide: Gyandoot, the Model for Community Networks. New Delhi: Tata McGraw-Hill.

Ramanathan, Sankaran, and Becker, Jorg (2001). Internet in Asia. Singapore: Asian Media, Information and Communication Centre.

Rao, Madanmohan and Raman, Nanditha (2009): ICT4D: Learnings, Best Practices and Roadmaps. Singapore: Asia Media, Information and Communication Centre.
Rao, Madanmohan (2004). The Asia-Pacific Internet Handbook, Episode VI: Asia Unplugged: The Mobile and Wireless Media Boom. New Delhi: Sage Publications.
Rao, Madanmohan (2003). The Asia-Pacific Internet Handbook, Episode V: News Media and New Media. Singapore: Times Academic Press.
Rao, Madanmohan (2002). The Asia-Pacific Internet Handbook, Episode IV: Emerging Powerhouses. New Delhi: Tata McGraw-Hill.
Rheingold, Howard (1994). The Virtual Community: Homesteading On The Electronic Frontier. New York, New York: Harper Perennial.
Singhal, Arvind and Rogers, Everett (2001). India's Communication Revolution: From Bullock Carts to Cyber Marts. New Delhi: Sage Publications.
Tomsen, Mai-Ian (2000). Killer Content: Strategies for Web Content and E-commerce. Massachusetts: Addison-Wesley Longman.
Zeff, David (2002). China Dawn: The Story of a Technology and Business Revolution. New York: Harper Business.

Part I
Foundations

Chapter 1

Manish Dalal

Internet and India

A Bond that's Growing Stronger

Editor's Note

This chapter observes that in just 15 years the Internet has changed the social and economic fabric of much of the world; we cannot imagine living a life without the Internet today! In 1985, the first .com domain name was registered and .com celebrated its 25th anniversary in 2010. Of the approximately 200 million Web sites in 2010, more than 80 million have a .com domain name extension. In 1996, India's first .com domain name went live: Rediff.com was registered and India was on the .com map. Today, the mobile phone forms the largest piece in the digital fabric in India, and outstrips PC penetration in rural India. India is now second only to the United States for Internet browsing on mobile phones, registering the second highest number of Web page views using handsets. The stickiness of content in local language is a global phenomenon, and will be spurred by ICANN's support for domain names that can be written entirely in the local Indian languages such as Hindi, Bengali, Punjabi, Urdu, Tamil, Telugu and Gujarati. A number of studies have shown the positive correlation between mobile and broadband Internet adoption and local as well as national economic growth. Other emerging trends include the rise of social media, and best practices in public-private partnerships in ICT rollout.

The real voyage of discovery consists not in seeking new landscapes but in having new eyes.
Marcel Proust
1871 - 1922

A senior manager, let's call him Arjun, sat brooding at his desk. *"Will the Internet change everything?"* He knew it would, but he was struggling with the *"How?"* And in the pursuit of an answer, Arjun thought of visiting a famous Zen master. As they sat sipping tea, the Zen scholar, in answer to Arjun's question, remarked -
"Then there was the mountain.
And then there was no mountain."

"I don't quite get it sire," said Arjun, perplexed.

The Zen scholar then narrated, *"This story goes back many thousand years, a time when tectonic shifts were far more frequent than they are today. Late one night a small hamlet of 500 was jolted by a booming sound with the earth shaking below them. However, the real surprise for the villagers of the hamlet was to reveal itself in the morning. When the villagers woke up to greet the rising sun, they could not believe what they saw. A mountain stood before them on what was their playing field until the previous day. A mountain out of nowhere! Their lives changed forever, but not for long. The subsequent generations of villagers did not look at the mountain with the same sense of awe as their fathers. And as time went by, the stories of the origin of the mountain also started to fade away and the mountain became a part of the villagers' lives as if it were always there."*

This parable is very applicable to the early days of the Internet. Many managers were unable to imagine what the world, business and otherwise, would be with the advent of the Internet. While they did understand that the Internet would have a far reaching impact, they could not comprehend at that time how it would change the social and economic fabric of the world. Fast forward to today – we cannot imagine life without the Internet!

An Evolving Network

Theorists postulate that any network, including the Internet, evolves from a stage of early adoption to maturity. This stage of maturity is called the commoditisation phase, a phase in which the users of the network reap the most value from it.

In the early 1980's, which were the initial days of the development of the Internet, the key challenge for computer scientists was to get an email from one network to another, as routing was a manual process. As more entities connected into this fledgling network, the need for an organising principle became key and urgent. Bringing order to the increasingly chaotic network fell on Jon Postel and his colleagues at the University of Southern California's Information Sciences Institute.

Postel became the Request For Comment (RFC) editor in 1969 and, as RFC editor, he and his colleagues shaped the Internet as we know it today[1]. In October 1984, RFC 920 published "the requirements of establishing a new domain in the ARPA-Internet and the DARPA research community". RFC 920 made a mention that "Domains are administrative entities. The purpose and expected use of domains is to divide the name management required of a central administration and assign it to sub-administrations." This set the stage for the birth of the .com domain name extension, which VeriSign, Inc. has been managing since 1995.

In 1985, the first .com domain name was registered and .co m celebrated its 25th anniversary in 2010. The history of the Internet and that of the .com are intertwined and it is impossible to imagine one in the absence of the other. It is estimated that of the approximately 200 million Web sites in 2010, more than 80 million have a .com[2] domain name extension.

Table 1: The Oldest .com[3] domain names

Rank	Date	Domain Name
1	15-Mar-85	Symbolics.com
2	24-Apr-85	BBN.com
3	24-May-85	Think.com
4	11-Jul-85	MCC.com
5	30-Sep-85	DEC.com
6	7-Nov-85	Northrop.com
7	9-Jan-86	Xerox.com
8	17-Jan-86	SRI.com
9	3-Mar-86	HP.com
10	5-Mar-86	Bellcore.com
11	19-Mar-86	IBM.com
12	19-Mar-86	SUN.com
13	25-Mar-86	Intel.com
14	25-Mar-86	TI.com
15	25-Apr-86	ATT.com

Small Beginnings for India

India dialed in, literally, to the Internet on the eve of its 48th Independence Day celebrations in 1995, when the government announced the availability of Internet access to end-users through a state owned entity, Videsh Sanchar Nigam Limited (VSNL). Users could dial into the Internet through VSNL's dial up service, which was initially made available in six cities across the country. It was the beginning of a technological revolution.

In the next year, India's first .com domain name went live. Rediff.com was registered and India was on the .com map.

The government laid the foundation of a larger Internet revolution in 1998 when it allowed private players to become Internet Service Providers (ISPs), thereby ushering in greater choice of bandwidth vendors for end-users. Satyam Infoway (Sify), promoted by the erstwhile Satyam Computer Services, was the first private ISP to launch operations. With the Internet becoming more ubiquitous, the process to get an Internet connection became simpler and the wait shorter. Consumer Internet adoption began to grow in India and Internet connectivity had begun its journey towards commoditisation.

Did You Know?

- www.symbolics.com was the first.com domain name sold on March 15,1985. Symbolics,Inc was a US based computer manufacturing company
- IBM, Intel, AT&T and Cisco were among the early adopters of .com
- By 1992, there were nearly 15,000.com domains registered
- In 1997, the number of domain names registered crossed the one million mark; Over 20 million new domains were registered in the next two years alone
- 21 million.com domain names were registered between 1985 and 2000 almost three times that amount, 57 million were registered in the decade from 2000 to 2010
- In 2010, .com celebrated its 25th anniversary

The private ISPs also created an opportunity for small businesses to participate in the growing success story of the Internet. The Public Call Office (PCO) owners extended their portfolio of telephony services to include browsing services. This enabled many consumers to enjoy their first experience with the Internet. As the popularity of the Internet began to increase, so did the number of PCOs offering Internet access. Stand-alone cyber cafés in smaller towns too began participating in this phenomenon.

By 1999, the Internet industry had taken off in India and many financial institutions and business groups had registered .com domain names and businesses. In late 1999, IndiaWorld, a collection of India-centric content-rich Web sites like www.samachar.com, www.khel.com and www.khoj.com was acquired by Sify. Sify paid $115 million for the transaction in a bid to acquire content which could keep consumers coming back to its website.

The deal was significant in its implications as it fueled the ambitions of many Indians and established that the World Wide Web could present some serious business opportunities.

Meanwhile, the excitement surrounding the .com opportunity in the Western World reached near euphoric levels around the turn of the century. The honeymoon was short-lived however; the beginning of the new millennium did not augur well for the .com industry when the bubble burst in 2001.

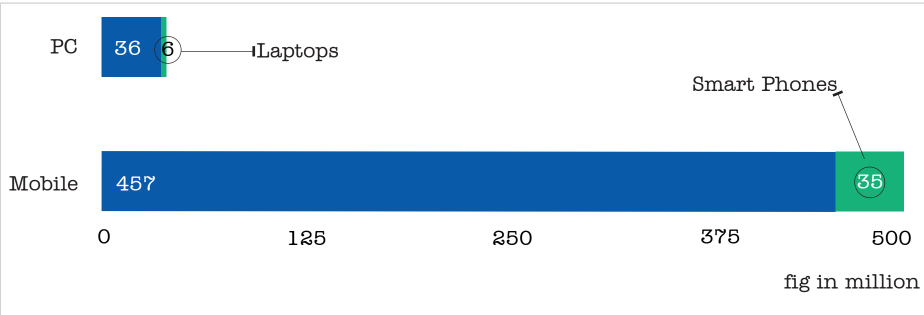
Ironically, it was in the same year that the Indian Railways Catering and Ticketing Corporation launched their railways ticketing portal, www.irctc.in. This was the Indian government's initiative to weave the Internet into every Indian's life. The portal commanded instant acceptance with the masses and the classes. PCO owners and cyber cafés contributed their bit by offering railway-ticketing services.

India's Present Digital Position

India is a young country with over half of the country below the age of 26[4] and quite technology-savvy. This preoccupation with all things technology became evident when Nokia emerged as the most searched brand in India according to the first Google Brand Zeitgeist[5] for India.

The mobile phone forms the largest piece in the digital fabric in India; the PC and smart phones (converged devices) being the other two, as shown in Figure 1:

Figure 1: The Indian Digital Fabric



In mid 2010, India had an installed base of nearly 42 million PCs[6]. Even though the penetration is very low at single digits, the market has been growing - it grew at 33

per cent year-on-year quarterly growth (Q1 2010 as compared to Q1 2009)[7]. This can be attributed to the choice of brands and vendors, falling hardware prices, access to financing, increased connectivity, and greater exposure and familiarity with the PC.

The momentum in the PC market is now being witnessed in smaller towns and cities and from lower SEC (Socio Economic Classification) consumers[8]. In urban cities, there is evidence of commoditisation of the PC market – PCs are now being sold along with consumer durables in multi brand electronic gadget stores.

Industry sources estimate that corporates in India purchase nearly three in five PCs. This proved to be problematic during FY 08-09 when corporates scrimped on IT spending resulting in an unprecedented 8 per cent dip in PC shipments[9]. The dip in PC shipment assumes significance in light of the fact that the Indian economy was rather insulated from the meltdown with the buoyancy maintained by domestic consumer spending[10]. Seemingly, had there been an active consumer PC market in India, this dip would have been much less.

During the period when PC sales were declining, the smartphone market (phones like the Nokia E71, which cost more than an average desktop) experienced a strong surge of 78 per cent growth, suggesting the preference that consumers had for advanced mobile phones over PCs.

India Improves its Network Readiness Ranking

- Every year the World Economic Forum releases the Global Information Technology Report, w hich uses the Networked Readiness Index (NRI) to measure the degree of preparation of a nation or community to participate in, and benefit from ICT developments.
- The NRI is composed of three component indexes, which assess:
- The environment for ICT offered by a given country or community.
- The readiness of the economy's key stakeholders, i.e., individuals businesses and governments.
- The usage of ICT among these stakeholders.
- These three component indexes are compiled by studying 68 indicators in aneconomy that range from studying the political and regulatory environment of the country to the readiness of businesses to adopt and use information and communication technologies.
- India registered a surge in its network readiness by moving to 43 in the NRI 2009 – 10 up from 54 the previous year. India is also ranked at the third spot in the Lower Middle Income group, behind China and Tunisia.
- World Bank ranks economies according to the 2008 GNI per capita data into low income, lower middle income, upper middle income and and high income. Low Middle Income group countries have GNI per capita ranging between $976 and $3,855.

Internet and its Usage in India

India is home to 81 million Internet users[11]. Nearly 80 per cent of Internet users in India surveyed in a study access the Internet to look for general information[12], after email.

Figure 2: Activities on the Internet

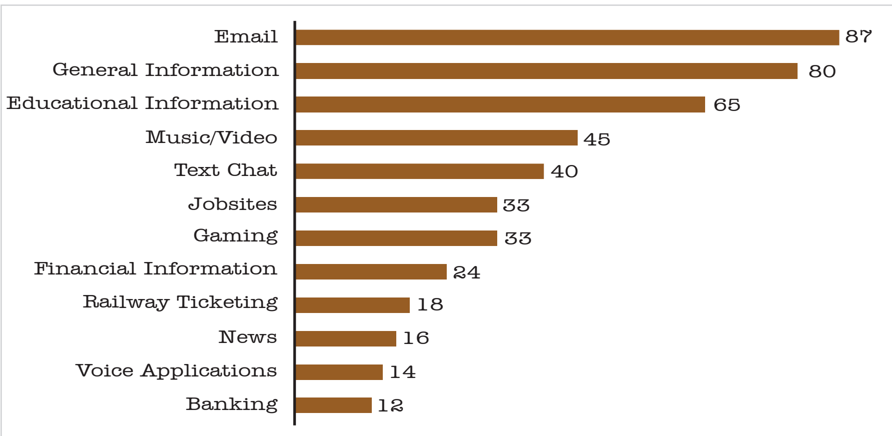
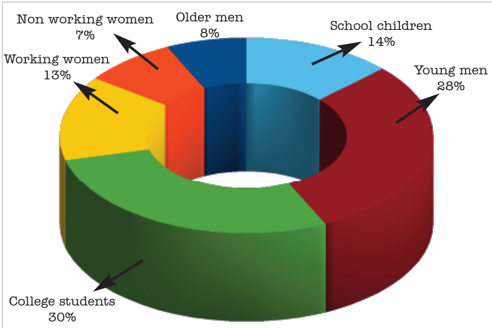


Figure 3: Internet Usage by Demographics



The usage is concentrated among younger Indians. School children (8 – 17 years) and college students (18 – 25 years) make up 44 per cent of all Indian users of the Internet. If young men (21 – 35 years) are added, this figure is as high as 72 per cent.

The Internet market in rural India is also showing encouraging signs, with an increase in the number of daily users. Although Internet penetration in rural India stands at only 1 per cent of the total population, the growth in the number of active users who access the Internet on a daily basis is as high as 25 per cent in rural areas, compared to a 14 per cent in urban areas[13]. The total number of Internet users in rural areas who access the Internet on a daily basis is currently 72 per cent compared to 85 per cent in urban India[14].

The 'Mobile' Indian

It is estimated by some commentators that by 2020, the mobile phone will be the primary device for connectivity to the Internet, globally.[15] Therefore, trying to look at the future of the Internet in India or anywhere in the world without closely analysing the role of the mobile phone may perhaps be akin to driving on a highway while looking in the rear view mirror.

India is among the fastest growing mobile phone markets in the world, registering a growth of 49 per cent year on year between April 2009 and April 2010, according to the Telecom Regulatory Authority of India (TRAI). This growth is in stark contrast to the lower adoption of the PC in rural markets. The mobile phone has ostensibly become the preferred device among rural Indians because of its portability and intuitive nature, in addition to its core voice-calling feature. Growth in mobile subscriptions is also aided in part by the wide choice of mobile operators and handsets, decreasing tariffs, schemes such as lifetime validity of connections, free incoming calls and SMS, etc. Stories are in abundance about people's love for their mobile phone. Villagers in Karaj in the Sagar district of Madhya Pradesh for instance, are known to walk 20 kilometers to get their mobile phones charged.[16]

In 2008-2009, the growth rate of rural subscribers embracing mobile telephone services had overtaken the growth of urban mobile subscribers. The higher growth rate among rural subscribers is also due to the near saturation in urban market especially the metros where mobile penetration is in excess of 90 per cent. With its widespread adoption, it is perhaps logical to assume that the mobile phone will drive penetration of the Internet into the Indian hinterland.

Given the pervasiveness of the mobile phone, an emerging trend is its use to access the Internet, at least in urban areas. It is estimated that nearly 70 per cent of active mobile-Internet users are college students and young men. This demographic segment falls in the age group of 18-35 years, which is the highest contributor to the total active Internet user base irrespective of the access device[17].

This is no doubt an interesting development in the Internet market. While Internet access through the mobile phone is a recent phenomenon, it is rapidly gaining traction. One in every four users accesses the Internet on their mobile phones[18], although most of them are 'dual' users'[19] which means they access the Internet on their PCs too. According to TRAI, at the end of March 2009, 118 million wireless subscribers[20] accessed the Internet through their wireless connections, which far exceeded Internet subscription through traditional modes. This is a strong indication of things to come.

A November 2009 report from Informate Mobile Intelligence indicates that India is now second only to the United States for Internet browsing on mobile phones, registering the second highest number of Web page views using handsets[21]. Users with a mid to high priced handset spend nearly 40 minutes browsing[22] every day.

Indeed, for a large number of small-town and rural Indians the first experience with the Internet is likely to be on the mobile phone, particularly when 3G services start to roll out. Telecom operators appear to realise this immense potential and recently bid $150 billion for the 3G and Broadband Wireless Access (BWA) spectrum[23].

There is immense excitement among the government and marketers about the possibilities of leveraging the wireless Internet to reach the rural masses in India. In early 2010, a WiMAX trial in Guwahati, Assam exceeded all expectations and was deemed a success. Government officials are exploring the possibility of connecting remote regions of the country with this technology because it permits Internet access within a 10-mile radius of a central mast[24].

With 3G, the penetration of mobile Internet could accelerate. At such a time, the number of mobile Internet users may far outnumber the users that access the Internet via PCs or Internet tablets[25].

Wireless Internet penetration, besides facilitating connectivity, will also truly revolutionise service delivery in India. It could for instance take organized financial services to more than 400 million (out of the 600 million) users of mobile phones who do not have functional bank accounts at this time.

Local Content is King!

What is interesting about the Internet is that even incidental learning or unsupervised learning is easily possible. Therefore, it is not the device but the content on it that is key to driving greater usage of the Internet.

The world stood up and took notice of a watershed event in a nondescript area of our nation's capital. The hole-in-the-wall experiment has today become a global case study in what its founder Dr. Saugata Mitra describes as 'minimal invasive education'[26]. On January 26, 1999, Dr. Mitra's team carved a 'hole in the wall' that separated his company's premises from an adjoining slum in a part of southern New Delhi[27]. It was through this hole, that the residents of the slum could access a computer freely. Soon, the computer started to attract the slum children in large numbers and they quickly learned to use the computer and started to play with this modern piece of technology even though they had never seen something like it before. This journey of learning was self-navigating. With no prior experience and training, the children learned to use the computer on their own.

This experiment was soon replicated in two other villages in Northern India and the results were similar[28]. It led Dr. Mitra to hypothesise that the acquisition of basic computer skills by any set of children can be achieved through incidental learning provided the learners are given access to a suitable computer facility, with locally relevant content[29].

Even among the largely English-speaking base of Web users in India today, nearly three-quarters prefer to read in a local language[30]. The propensity of the urban Indian consumer to access Web applications in their local language is rather high. This is not just limited to email or Web 2.0 applications but extends to online transactional activities as well[31].

The usage of regional content on Internet is largely driven by content related to entertainment, news, and sports[32]. For the purpose of the report, entertainment encompasses social media, blogging, etc. The report adds that there is a huge demand for regional content especially in South India. Online shows are also being launched to grab the attention of the Internet audience. These shows are being designed exclusively for the online medium. Balaji Telefilms, for instance, released its first ever fiction episodes on the web known as 'Bol Niti Bol', which is made available to the users on YouTube.com, Mid-Day.com and Rediff.com[33]. Other TV channels are also starting to make available their TV content online.

Companies, like Facebook, are now beginning to offer their services in the local languages. Facebook announced its support for content in Hindi, Punjabi, Bengali, Telugu, Tamil and Malayalam languages in May 2010[34]. Wikipedia is also available in Hindi.

Some of these surfing habits are replicated when Indians are on the Internet through their mobile phones. Facebook, Orkut and Youtube all feature in the top five websites that Indian users access through their mobile phones[35].

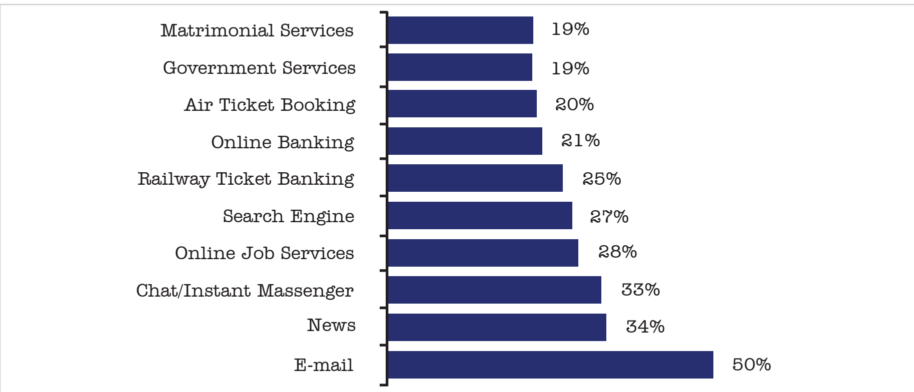
Another example of locally relevant content is the popularity of matrimonial sites. Matrimonial sites in India are far more popular than job sites and thus it should not be surprising that major players are placing bets on their success. A number of venture capital firms have invested in major Indian matrimonial sites because of their local appeal and popularity (See Table 2).

Table 2: Investment in Indian Matrimonial Sites

No.	Website (Company)	Investee Company (s)
1	www.jeevansaathi.com (Infoedge)	Kleiner Perkins and Sherpalo Ventures
2	www.shaadi.com (People Interactive)	Sequoia India
3	www.bharatmatrimony.com (Bharat Matrimony Group)	Canaan Partners and Yahoo

Source: Various News Reports

Figure 4: Preferred Application for Vernacular Content Delivery



Source: Vernacular Content Market in India – 2008, IMRB

The stickiness of content in local language is a global phenomenon. The number of Internet users worldwide reached 1.9 billion earlier this year[36]. While the dominant language used on the Internet is English, nearly 60 per cent of Internet users are non-English speaking[37]. The geographic expansion of the Internet and the corresponding increase in Internet usage by various nations, groups and communities that speak different languages have eventually contributed to the need for domain names that consists of characters from languages other than English.

A giant leap in making the Internet truly local was taken in October 2009, when ICANN (Internet Corporation for Assigned Names and Numbers) announced the launch of Internationalised Domain Names (IDNs) that can be written entirely in the local language. IDN is a landmark development because it marks the arrivals of domain name addresses in local scripts.

The Department of Information Technology (DIT) and Centre for Development of Advance Computing (C-DAC) are leading the way to introduce IDNs in Indian languages. DIT submitted its application to ICANN in May 2010 for its approval of the launch of the new TLD, .bharat in seven Indian languages -- Hindi, Bengali, Punjabi, Urdu, Tamil, Telugu and Gujarati. DIT's application has reportedly received the initial clearance for IDNs in all the seven regional languages, but final approval will still be needed. Once fully approved and implemented, it will be possible for many Indians to navigate the Internet using their local/native language. Also, C-DAC is reported to be ready with the technology to affect the change and is anticipated to roll out the IDN country code TLDs in 2011[38].

Internet and the GDP

A direct impact of Internet adoption is economic growth. A study by the World Bank has revealed that for every 10 percentage-point increase in the penetration of broadband services, developing countries can see their economy grow by 1.3 percentage points[39]. Similarly, another study carried out independently by Boston Consulting Group and Telenor established that an increased adoption of Internet could potentially accelerate business productivity, which could lead to generating more income, jobs and government revenues in emerging economies[40].

The collective impact of the increasing penetration of broadband services and the resultant growing adoption of the Internet, can lead to far-reaching and unprecedented changes in the social and economic fabric of India. The wide spread penetration of the Internet will generate value for the users. The Indian Government is taking proactive steps to enhance broadband penetration in the rural India and has sanctioned the roll out of five-lakh kilometers of optical fibre network to connect all gram panchayats in the country[41]. These efforts can be accelerated when the government starts to create Public Private Partnerships (PPP) to generate and sustain employment, development and growth. A widespread PPP application also is not the solution. The efforts must be focused on goals that create a larger growth environment. For instance, one laptop a child must come to India in a far more organised and channelised manner to enable the proliferation of not only information technology but also education, rather it is foundationed on the premise of delivering education, thus making the initiative sustainable. The government may also partner with private institutions that generate locally relevant content that can be supplied to one segment for free and monetised from a segment to pay for the costs and create a viable business model around delivering a service.

The government's initiatives must be centered around ensuring sustainability of both the initiative and the organisation delivering it. And PPP is an effective route to achieve it.

The Future is Different

While the technology underlining the network (the Internet) may have ostensibly seen only incremental shifts, something fundamental has changed about the Web since its inception. The traditional Web was static; the new Web is a conversation. The sheer global popularity of social networking sites is testimony that the entire globe is talking to one another. US Web surfers are spending more time socialising on Facebook than searching on Google, according to data from researchers at comScore Inc[42].

The Economic Impact of Connectivity

The mobile industry in India is a major contributor to the social and economic growth of the country, in terms of employment generation, revenues to the government, GDP growth and rural development, according to a study "The Economic Benefits of Mobile Services in India" by Ovum, a market research agency in 2005. The report estimates that the mobile industry had created 3.6 million jobs directly and indirectly. The report also adds that access to telecommunication devices substantially improves the social and economic condition of people living in rural areas by improving access to family, education, health and financial services, and by enabling the development of non-agricultural economic activity.

A striking example comes from the research of Professor Robert Jensen of Harvard University on fishermen in the South Indian state of Kerala. He found that fishing boats in the state came ashore early every morning, and fishermen auctioned their catch to traders within an hour at dozens of shore points. Since fish is highly perishable, the catch needs to be taken quickly from the shore to retail markets.

However, neither the fishermen nor the traders knew how much fish would land at which retail points. As a result, the price of fish could vary by 50 per cent between two shore points just 15 kilometers apart. Some markets faced shortages of fish while in others, there was an excess supply of fish with few takers. The unsold fish surplus, averaging 6 per cent of the total catch, rotted quickly and had to be thrown away daily.

Jensen saw that the problem would largely disappear with the arrival of mobile phones, which were being introduced in three phases along the coast. So he organised a research project to monitor the consequences. Fishermen rapidly took to mobile phones, and began making calls to traders while still at sea and this bridged the time and information gap. Many fishermen began selling their catch on the phone while still at sea, and then steered their boats to the shore points with the precise volume of fish where their respective buyers were waiting.

The volatility of fish prices fell dramatically. There was little difference between the price of fish at different shore points, and this provided more certainty and security to fishermen. Mobile phones also eliminated the wastage of 6 per cent of the catch due to waiting buyers. This resulted in an increase in the income of the fishermen and the traders too. Even the consumer benefited because fish prices came down. It was a win-win-win situation.

Fishermen profits were up 8 per cent and consumer prices were down 4 per cent, directly driving a consumer surplus of Rs 20/ person per month - an equivalent of a 2 per cent increase in per-capita GDP from this one market alone.

The mobile phone is likely to emerge as the computing and communication device of choice. Faster processing speeds, greater storage capacity and broadband on the mobile phone will help further enhance user experience[45].

A similar survey analysing the browsing habits of people in 10 emerging markets revealed remarkable similarities to mature markets in the usage of Internet services[43]. The countries studied were India, Jordan, Kenya, Madagascar, Mauritius, Morocco, Pakistan, Thailand, Ukraine and Vietnam. Social networking sites (primarily Facebook) were also highly popular in all studied countries, topping the list in two of these countries. The Internet is revealing itself as a medium to connect people with their peers in these countries as much as anywhere else in the world.

The traditional Web was tethered to the computer (desktops and laptops); the new Web is device neutral. The new Web is connecting to devices of all forms and utilities. For instance, the 12 million Facebook users in India upload nearly 53 million photos in a month with many of these users connecting to Facebook through their mobile phones[44]. Regardless of trends, technology tends to have no limits, so the new and emerging digital world is not likely either to slow down or to level off. Information technologies combined with the amplifying effect of the Internet will contribute to every facet of an Indian's life spanning from education to governance to enterprise. It is being perceived that anaverage Indian's life will move from an era of information asymmetry to one of information accessibility. In the words of Paul Valery:

"The trouble with our times is that the future is not what it used to be."

References

1 *According to http://www.25yearsof.com/25years/*

2 *According to http://www.itif.org/publications/internet-economy-25-years-after-com*

3 *From a Report titled "The Internet Economy 25 years after .com". The Report is available for download from http://www.itif.org/publications/internet-economy-25-years-after-com*

4 *According to https://www.cia.gov/library/publications/the-world-factbook/geos/in.html*

5 *According to http://www.watblog.com/2010/05/31/google-releases-first-brand-zeitgeist-for-india-trends-analysis/*

6 *Estimates by Juxt Consult*

7 *According to Manufacturers Association for Information Technology (MAIT). Press Release available on http://www.mait.com/admin/enews_images/eNL per cent per cent20on per cent per cent20Annual per cent per cent20Industry per cent per cent20Peformance per cent per cent202009-10.pdf*

8 *According to I Cube 2009. Report available on http://www.iamai.in/Upload/Research/icube_new _curve_lowres_39.pdf*

9 *According to Manufacturers Association for Information Technology (MAIT). Press Release available on http://www.mait.com/admin/enews_images/eNL%20on%20Annual%20Industry%20Peformance%202009-10.pdf*

10 *From a news article in the Times of India titled India will emerge least affected in global meltdown: PM. The article is available on http://timesofindia.indiatimes.com/business/india-business/India-will-emerge-least-affected-in-global-meltdown-PM/articleshow/4195635.cms*

11 *According to http://www.internetworldstats.com/top20.htm, updated for June 30, 2010*

12 *According to India Online 2009, a report by Juxt Consult. Report available for download on http://www.juxtconsult.com/download.asp*

13 *According to India Online 2009, a report by Juxt Consult. Report available for download on http://www.juxtconsult.com/download.asp*

14 *According to India Online 2009, a report by Juxt Consult. Report available for download on http://www.juxtconsult.com/download.asp*

15 *http://www.pewinternet.org/Reports/2008/The-Future-of-the-Internet-III.aspx*

[16] *According to a news article in FoneArena titled "A mobile phone using village that does not have electricity," published on December 30, 2007. The link is available at http://www.fonearena.com/blog/710/a-mobile-phone-using-village-that-does-not-have-electricity.html*

[17] *According to I Cube 2009. Report available on http://www.iamai.in/Upload/Research/icube _new_curve_lowres_39.pdf*

[18] *According to India Online Landscape 2010, a report by Juxt Consult. Report available for download on http://www.juxtconsult.com/download.asp*

[19] *According to India Online Landscape 2010, a report by Juxt Consult. Report available for download on http://www.juxtconsult.com/download.asp*

[20] *According to http://www.trai.gov.in/WriteReadData/trai/upload/PressReleases/692/pr13july09no59.pdf*

[21] *According to Emerging Markets: You've got mail, Expanding Horizons 1/2010. Available for download on http://www.nokia.com/corporate-responsibility/news/expanding-horizons*

[22] *According to Surf's Up. The Rising Wave of Mobile Surfing, Expanding Horizons 1/2010. Available for download on http://www.nokia.com/corporate-responsibility/news/expanding-horizons*

[23] *From a news report in the Statesman dated May 31, 2010. The link is available at http://www.thestatesman.net/index.php?option=com_content&view=article&id=329645&catid=40&Itemid=53*

[24] *From a blog post on Site Point titled India's Grand Internet Ambitions dated April 07, 2010. The link is available at http://blogs.sitepoint.com/2010/04/07/india-broadband-internet-ambition/*

[25] *According to Emerging Markets: You've got mail, Expanding Horizons 1/2010. Available for downloadon http://www.nokia.com/corporate-responsibility/news/expanding-horizons*

[26] *From the paper - Minimally Invasive Education for mass computer literacy presented at the CRIDALA2000 conference, Hong Kong, 21-25 June, 2000. The paper is available for download on www.hole-in-thewall.com/docs/Paper12.pdf*

[27] *http://www.hole-in-the-wall.com/Beginnings.html*

[28] *http://www.hole-in-the-wall.com/Beginnings.html*

[29] *http://www.hole-in-the-wall.com/Beginnings.html*

[30] *According to India Online 2009, a report by Juxt Consult. Report available for download on http://www.juxtconsult.com/download.asp*

[31] *According to Vernacular Content Market in India, a report released by Internet and Mobile Association of India (IAMAI) in 2008. Report is available for download at www.iamai.in/Upload/.../Vernacular %20Content%20Report_29.pdf*

[32] *According to Vernacular Report 2009, a report released by Internet and Mobile Association of India (IAMAI) in September 2010. Report is available for download from http://iamai.in/Reports1.aspx*

[33] *According to Vernacular Report 2009, a report released by Internet and Mobile Association of India (IAMAI) in September 2010. Report is available for download from http://iamai.in/Reports1.aspx*

[34] *From a news report titled, "Hello India! Facebook Now Available In Local Languages of Almost 1B More People," in the Read Write Web dated May 31, 2010. The link is available at http://www.readwriteweb.com/archives/hello_india_facebook_now_available_local_languages.php*

[35] *http://trak.in/tags/business/2010/11/25/mobile-internet-growth-india-2/*

[36] *According to http://www.internetworldstats.com/top20.htm, updated for June 30, 2010*

[37] *From a report by Everture International. Report available at http://www.everture.com/news/article_ lingua.htm*

[38] *From a news report in DNA titled 'Soon .bharat domain names in Hindi, Marathi', published on October 27, 2009. The link to the story is available on http://www.cdac.in/html/press/4q09/spot690.aspx*

[39] *From the report Information and Communications for Development 2009: Extending Reach and Increasing Impact. Report available on http://web.worldbank.org/WBSITE/EXTERNAL/ TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTIC4D/0,,contentMDK:22229759~menuPK:5870649~pagePK:64168445~piPK:64168309~theSitePK:5870636,00.html*

[40] *From a news article published on www.nortrade.com (The Official Norwegian Trade Portal). The link is available at http://www.nortrade.com/index.php?cmd=show_news&id=4095*

[41] *From a news report titled, "Special purpose vehicle planned for broadband push," in the Hindu Business Line dated July 24, 2010. The link is available at http://www.thehindubusinessline.com/2010/07/24/stories/2010072453070100.htm*

[42] *From a news article published in the Times of India titled 'Facebook becomes 'bigger' than Google on September 10, 2010. The link is available at http://timesofindia.indiatimes.com/tech/news/internet/Facebook-becomes-bigger-than-Google/articleshow/6528901.cms*

[43] *According to Surf's Up. The Rising Wave of Mobile Surfing, Expanding Horizons 1/2010. Available for download on http://www.nokia.com/corporate-responsibility/news/expanding-horizons*

[44] *From a news report on JustAskGemalto.com titled 'Asia: The Wired Continent - India' dated September 10, 2010. The link is available at http://www.justaskgemalto.com/en/focus/asia-wired-continent-india*

[45] *From a paper titled "Opportunities and Innovations in the Mobile Broadband Economy" by Scott M. Andes and Daniel Castro. Available for download on http://www.itif.org/publications/opportunities-and-innovations-mobile-broadband-economy*

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Rajnesh D. Singh

The Future Is In The Cloud

Editor's Note

This chapter traces the extensive growth of the Internet, its protocols and cloud computing. Seeing the wide usage of the Internet, it's expected that in 2011 the global Internet user base will exceed the two billion mark and the number of mobile broadband users will reach a billion. Comparing statistically, we Indians need to go a long way before we can compete with nations like China, whose 420 million Internet users and 364 million broadband users befit their tag of a superpower when compared to India 80 million Internet users and 10 million broadband users. Also, a point to be taken into consideration is that India's GDP has been estimated to grow by Rs. 162 billion (US$ 3.6 billion) for every percentage point increase in mobile broadband penetration. Thus, the internet is a critical component to India's socio-economic development. For the developing world, cloud computing can be seen as a great equalizer, its greatest advantage lying in the overall cost savings it can provide, in terms of IT infrastructure, especially for governments, businesses and NGOs in India.

Ever since being made publicly available some twenty-odd years ago, the Internet has progressively evolved to have a profound impact on how we live, work, and play. Today, the Internet plays an important role in many aspects of society. From being a business tool, to being used for education and healthcare, the Internet's utility - and the innovation and creativity of people who have developed applications and services around it - are truly amazing.

Looking back at the history of the Internet, one notes that ever so often, some innovation or other has resulted in a complete change in how we go about our daily lives and how we interact with others. More and more, the Internet has made the digital age a part of our everyday lives, and brought about entirely new ways of doing things.

Vint Cerf and Bob Kahn's ground-breaking work in the 1970s gave way to what we now know as the Internet – the publicly accessible global network of networks. The development of the Internet Protocol (IP) allowed many networks to connect together and exchange information in a way that other proprietary protocols of that era could not allow. It is important to note and recognise that Cerf and Kahn decided that the Internet Protocol should be an open standard, and that it could be used and deployed by anyone who so wished. This was a critical decision that has allowed the Internet to grow and evolve, and has permitted innovation and creativity to flourish. The decision, and resulting expansion of the Internet, emphasises the value of open standards and underscores the vision that Cerf and Kahn had of an interconnected network able to connect anyone anywhere.

The creation of the Domain Name System (or DNS) was also a critical technical development. Each machine connected to the Internet is identified by unique identifiers called IP addresses, which are a string of numbers. The DNS allowed resources on the Internet to be referenced using commonly used and understood names as opposed to remembering strings of numbers. Until recently the DNS had been limited to the use of "English" in the form of a subset of the ASCII character set which includes a to z, A to Z, digits 0 to 9 and the hyphen. As the reach of the Internet increased, this created a problem for users who did not know English – they were unable to navigate the Internet using their own language.

Multilingual content on the Internet was available but the means to navigate the Internet was limited to a subset of the ASCII character set. This meant non-English speakers had to remember strings of names in a foreign language that they did not understand, and the resulting user experience was less than perfect. However, of late, more and more national languages and scripts are being made available on the Internet, and in the near future this will allow a greater proportion of the world's population to be able to navigate and use the Internet in their native language and script.

The World Wide Web

Perhaps one of the first great advances for the Internet in the public space was when Tim Berners-Lee devised the HTTP protocol. Due to his work, the Internet could now be navigated in a user-friendly manner, and documents and resources could be stored and accessed in a uniform manner, and thus the World Wide Web, or more commonly "the Web" was born. Berners-Lee devised a system which allowed interlinked hypertext (text which leads users to other related resources on demand). These documents (or webpages) can contain text, images, audio, video and other types of interactive media. It is important to note that the Web is not the Internet, but rather it is an application that runs on the Internet. The Internet is the underlying global network of networks that allows the Web (as well as numerous other applications and services) to function.

The Web itself has evolved significantly since it first came into being. From the early days of rudimentary text-based webpages, we today have feature-rich webpages with interactive content (sometimes also called Web 2.0). The modern Web can have webpages with an amazing amount of information, different ways to present that information, and many ways to interact with that information. One simply has to look at a personal homepage of a social network site like Facebook to see the diversity of content (and services) which are enabled in the modern webpage.

Historically, Web content has been a predominantly English-based resource. Much of the content and interaction around that content was available in English only. However, over the past couple of years much more content is available in local languages, which helps drive the Internet use and reach even further. This is evidenced by more and more major Web applications and sites being made available to users in multiple languages. The adoption of Unicode and the introduction of Internationalised Domain Names will help drive this even further.

IPv6

Internet Protocol version 6 (more commonly referred to as IPv6) is the next generation of the Internet Protocol which will succeed IPv4 (Internet Protocol version 4) on which much of the current Internet operates. IPv4 allows for just over four billion unique addresses, and when originally conceived it was thought this was going to be more than sufficient for the future. What the inventors did not realise was just how successful the Internet was going to be and how quickly it would scale and outgrow its unique number base. Current estimates indicate that the pool of IPv4 addresses will run out in 2011. This does not mean that the Internet will stop working in 2011, it will just make it very difficult for network operators and service providers to continue to expand their networks using IPv4 and hence there is a critical need to plan and deploy IPv6 to ensure business continuity. Realising the need for an expanded number of unique identifiers, the Internet Engineering Task Force (IETF), the body which develops standards for the Internet, begun work on IPv6 in the early 1990s with the first standards being defined in 1996 and the current design was finalised in 1998. IPv6 provides some 340 trillion usable addresses, enough for much of the foreseeable future.

In July 2010, the Government of India announced its national IPv6 roadmap . The roadmap calls for IPv6 networks being made available to citizens by March 2012, and all central and state government departments and public sector units must transition to IPv6 by the same date. The roadmap mandates that Internet Service Providers with a subscriber base of more than ten thousand must be in a position to offer IPv6 by December 2011. The Government also initiated the setting up of a National IPv6 Task Force and invited relevant stakeholders to help with delivering the national IPv6 roadmap.

Two Billion and Growing

According to Internet World Stats , the number of Internet users globally as on 30 June 2010 stood at 1.966 billion. This number corresponds to well over a quarter of the world's population. Based on current growth trends, it is expected that the two billion mark will be crossed sometime in 2011. The first one billion mark was crossed in 2005, and the second billion will be crossed some five years later – a remarkable achievement. Even more remarkable are estimates from Ericsson that, through the course of 2010, mobile broadband subscribers had grown to 500 million, and before the end of 2011, this number will double to 1 billion.

The greatest growth rates are being seen in the developing world. In percentage terms, this growth is led by Africa, the Middle East and Latin America and the Caribbean respectively.

In actual user numbers, Asia leads by far - adding over seven hundred million users between 2000 and 2010, and representing some 42 per cent of the current global Internet population.

India's Internet user population is estimated to be around 81 million, with some 9 million broadband users . Compare that with China's 420 million Internet users and 364 million broadband users .

These numbers are nothing short of embarrassing for India, a country that prides itself as an IT superpower, and sells itself as the premium global destination for IT outsourcing. Clearly, enough has not been done to promote and grow the country's Internet user base, and more so its broadband population.

Granted that India's mobile subscriber growth rate over much of 2010 has led the world, but therein is another irony. The growth is limited in uptake to voice and related services such as SMS. We do not see a corresponding increase in mobile Internet usage. Indian mobile operators have come up with various innovative business models to decrease service costs and increase penetration rates, but they have not focused much on the mobile Internet platform. With such a large subscriber base ready and willing coupled with the availability of 3G spectrum, it is perhaps high time that Indian mobile operators look more closely into delivering affordable and reliable mobile Internet services to the masses. Those mobile operators who can come up with an innovative offering that is both affordable and reliable, may well see an increase in market share in what is becoming a very crowded and competitive marketplace.

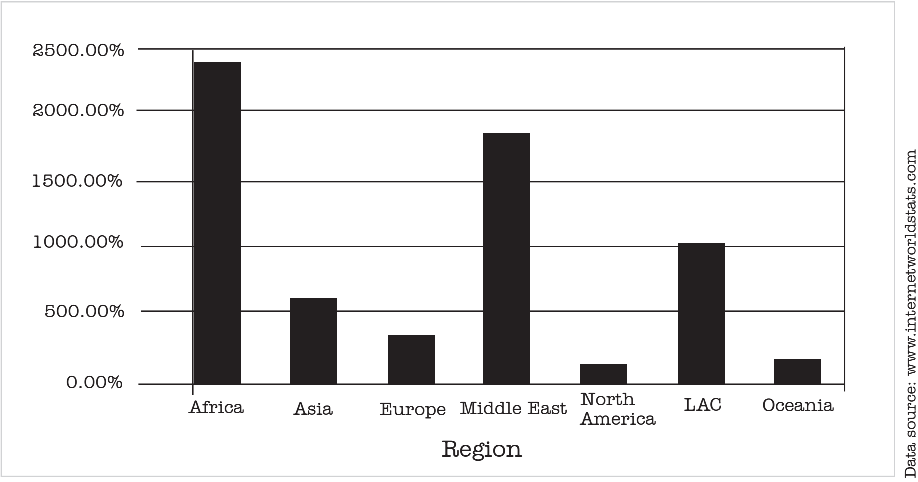
Internationalised Domain Names (IDNs)

According to the Internet Engineering Task Force's RFC 3696, from a technical point of view, domain names may be composed of any character which can be represented in an octet . The DNS root zone however, only allows domain names to be composed in a particular format and character set (as described earlier). To address the need of an increasingly linguistically diverse global Internet, work began in the mid-nineties to allow for the use of domain names in local languages and scripts. ICANN (Internet Corporation for Assigned Names and Numbers), the organisation that coordinates the Internet's naming system, approved the creation of internationalised country code top-level domains (IDN ccTLD) in October 2009 and in May 2010, the first of these were installed in the DNS root zone. These are now being progressively introduced by various economies .

In September 2010, ICANN announced that it had accepted and begun the string validation process for seven Indian languages submitted by the Government of India – Bengali, Gujarati, Hindi, Punjabi, Tamil, Telugu and Urdu. This means that after completing all the necessary steps, users in India (and around the world) will be able to use domain names represented in these languages (and its corresponding script), and in due course other in Indian languages as well.

This represents a big step forward in truly bringing the Internet to the masses, and the impact within India should be remarkable. With the introduction of 3G, the mobile platform will also be an important beneficiary and contributor to increasing Internet penetration within India. However, service providers have a critical part to play in making this happen - an affordable price structure and service plan for mobile Internet services is required, as is access to appropriate content.

Figure 1: World Internet Usage Growth by Region

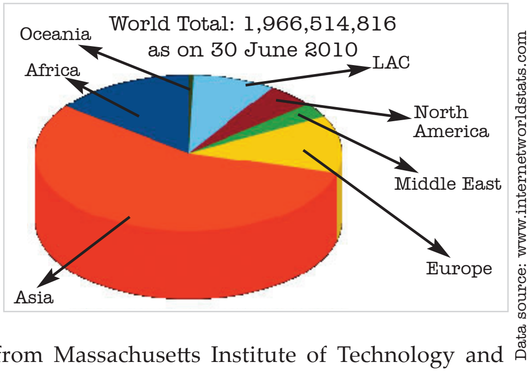


Broadband and the Economy

Various studies have regularly stated that there is a definitive correlation between broadband penetration rates and economic growth. In a study conducted by CEGR (2003) for the Broadband Industry Group on the impact of broadband on the UK economy it was estimated that:

- By 2015, the productivity benefits of broadband could be as much as 2.5 per cent resulting in an annual increase to the UK Gross Domestic Product (GDP) of £21.9 billion
- Additional benefits that could be realised by 2015 were an annual esti mated increase in UK fixed expenditures of £8 billion and an increase in annual net exports of £11 billion.

Figure 2: World Internet Users by Region



Another report by academics from Massachusetts Institute of Technology and Carnegie Mellon University stated:

> *"The results support the view that broadband access does enhance economic growth and performance, and that the assumed economic impacts of broadband are real and measurable. We find that...communities in which mass-market broadband was available... experienced more rapid growth in employment, the number of businesses overall, and businesses in IT intensive sectors, relative to comparable communities without broadband at that time."*

Unicode

A critical development in connecting the world has been the introduction and implementation of Unicode which allows compatibility in a multilingual environment. Unicode is perhaps best defined by the Unicode Consortium , the non-profit organisation that develops the unicode standard:

Fundamentally, computers just deal with numbers. They store letters and other characters by assigning a number for each one. Before Unicode was invented, there were hundreds of different encoding systems for assigning these numbers. No single encoding could contain enough characters: for example, the European Union alone requires several different encodings to cover all its languages. Even for a single language like English, no single encoding was adequate for all the letters, punctuation, and technical symbols in common use.

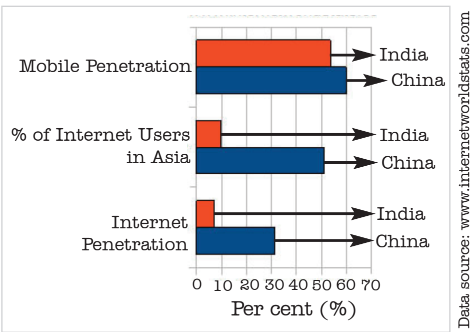
Unicode provides a unique number for every character, no matter what the platform, no matter what the program, no matter what the language. Incorporating Unicode into client-server or multi-tiered applications and websites offers significant cost savings over the use of legacy character sets. Unicode enables a single software product or a single website to be targeted across multiple platforms, languages and countries without re-engineering. It allows data to be transported through many different systems without corruption.

A study by the OECD (Organisation for Economic Co-operation and Development) probably best sums up the importance of broadband on the economy by saying:

> *"Broadband networks are an increasingly integral part of the economy. As the technology evolves and bandwidth increases, the scope for broadband to act as an enabler of structural change in the economy expands as it affects an increasing number of sectors and activities. Direct effects result from investments in the technology and from rolling out the infrastructure. Indirect effects come from broadband 's impact on factors driving growth, such as innovation, firm efficiency, competition and globalisation. Broadband facilitates the development of new inventions, new and improved goods and services, new processes, new business models, and it increases competitiveness and flexibility in the economy."*

India's GDP for the 2010 financial year is expected to be around US $ 1.367 trillon . Let us assume that instead of the 2.5 per cent increase mentioned in the UK study, the productivity benefit of broadband to the Indian GDP is 1 per cent. That 1 per cent translates to around US$ 13.67 billion. Let us halve that even, and we still end up with a value of over US$ 6.5 billion. Probably, it is not very scientific to make such a direct correlation, but the scale of numbers (or even a fraction of it) should indicate how important the adoption and widespread use of broadband could be to the Indian economy.

Figuer 3: Head to Head: China and India



A more recent report by research firm Analysys Mason suggests that India's GDP will grow by 162 billion rupees (US$ 3.6 billion) for every percentage point increase in mobile broadband penetration .

And its not just businesses who will benefit. The benefits of broadband availability cuts across sectors – from distance learning to telemedicine to agriculture. It can help in achieving greater efficiency and productivity, and it can open up a new world of learning for the young. Investments in broadband infrastructure will have obvious spin-off effects in other parts of the economy from construction and civil works to technical support services to education and training, and various auxiliary industries which all contribute to keep the economy running.

The availability of, and access to, broadband will also do one more thing – it will enable cloud computing and all it has to offer to the masses.

The Cloud Computing Promise

The term cloud computing is generally used to describe the use of centrally-located computer resources to deliver applications and services. These are typically delivered through a network to clients on an "anytime, anywhere" basis, and offer a range of benefits including cheaper overall operating costs, rapid deployment and development, and geographically dispersed system availability. In recent times, much effort has gone into promoting cloud computing. Knowingly or unknowingly, a large majority of today's Internet users have embraced cloud computing applications – examples include web-based email applications such as Gmail, Yahoo Mail and MSN, as well as social networking sites.

Perhaps one of the greatest advantages of cloud computing is the overall cost savings it can provide in terms of IT infrastructure. Now, the benefits of sophisticated IT systems, which were usually the domain of large companies and multi-national enterprises are available to everyone, particularly small to medium enterprises (SMEs). This creates, what could be called a level playing field as it offers the potential for a SME to use and gain the benefits of an IT system that a large multi-national uses.

Similar benefits are available to developing countries – governments in particular, as well as businesses, do not need to make large investments in hardware and software, nor do they need to dedicate vast resources to managing complex IT systems. All this can be left to the service provider, and government and business alike can focus their (sometimes limited) resources on their core business. In the case of government, this would be to serve and empower its citizens for socio-economic development. In the case of businesses, it would be to focus on what the business does, e.g. manufacturing, retail.

For a company in the cloud computing services and applications business, the nature of the business itself is all about being able to compete with the "big guns". The concept of cloud computing allows the development, deployment, marketing and sale of cloud applications worldwide – without having to invest in (potentially) expensive IT infrastructure, nor in dispersed (and expensive) sales and service locations. The provider is able to manage costs and overheads; in particular, the user is able to realise a service quicker, and generally speaking, cheaper.

Innovation in cloud computing continues at a rapid pace, but overall it is still an emerging area. There are several issues that need to be considered to fully deliver the cloud computing promise. Here are three issues to consider:

(i) **Vendor lock-in:** Once the user chooses a vendor/service provider, are they then locked-in to them? What happens if the user wishes to change the vendor? Will its business keep running through the change?

(ii) **Standards:** There is a general lack of industry-wide standards in cloud computing at present, though various groups are forming to consider this. Related to this are issues such as inter-cloud computing – how do two separate cloud systems talk to each other, how do they exchange information, and how do they reference data the other holds?

(iii) Industry Best Practice: Users need to be confident and comfortable in using the cloud and an industry code of conduct/best practice can help this along. Some questions that come to mind include: what happens if a vendor collapses - is the data portable?

For the developing world, cloud computing can be the great equaliser. It allows organisations, small and large alike, to be able to use the same applications and services earlier available to multi-nationals - at the same level of sophistication as in the developing world. Cloud computing applications and services that are available to an organisation in the Silicon Valley can be as easily and equally available to an organisation in India, or Vietnam or the Pacific Islands. Needless to say, to be able to use such applications and services will require reliable Internet access, and this is the challenge that policymakers and governments must meet as a national priority. Nowhere is this more urgent than India, where cloud computing has the potential to transform how businesses and organisations use IT, and how government itself delivers services to citizens at the central, state and local level.

The Future

India is developing at a rapid pace, though much of this development is concentrated in urban centres while the majority of the population resides in rural areas. As development moves slowly into rural areas, more and more people will realise the benefits of ICTs and the Internet in particular. The mobile platform is already an important part of everyday life, but thus far has been largely limited to voice and SMS services. The introduction of 3G services will change this and bring a larger part of the population online – in both urban and rural locations.

The younger generation will be a key contributor to Internet consumption. The proliferation of social networks has hastened this and will continue to do so in the immediate future. For those that have access, the Internet and applications and services that run on it will be an integral part of everyday life – much like electricity and water. And businesses and organisations will continue to embrace new technologies so that they can operate more efficiently and engage with their customers far better than ever before.

But there are also issues around the use of the Internet that must be considered. Of late, privacy issues have been highlighted by the global media. Privacy has many aspects to it, and as we put more information about ourselves online (through a variety of means including social networks and interacting with government/business services), it is becoming an increasingly important issue. Fundamental to this is where data is stored, who has access, and how this is controlled, as well as how secure the infrastructure storing all this information is.

In recent times, some governments have been putting more attention and urgency on how the Internet is used and what content is available to users. The most common action has been to either monitor use or filter content that is accessible. Apart from the right to privacy issues this brings up, there is also the matter of who decides what content is suitable and what is not suitable for consumption. That decision should solely be on the end user, not centrally controlled.

Network neutrality has also been an issue that is now receiving global attention. The premise of this resides in the principle that all content on the Internet should be available to all users without hindrance, i.e. that no one set of content should be prioritised over another, in particular no single content or service provider should be favoured. Various factors are coming together which are raising the importance of network neutrality. These include convergence and Internet applications and services which are bandwidth-intensive such as video. Traditional voice revenues for telecommunications companies are fast eroding, and this is forcing them to seek alternative revenue streams.

One such alternative that is being pursued by telecommunications companies is to prioritise traffic from some content providers – at a price. The problem with this approach is that for the user, it means that their Internet access experience will be optimised for particular content providers, and for other content providers the user experience may be less than satisfactory, i.e. slower access speeds/time to load web pages or applications and services. Related to this is how mobile Internet access and fixed line Internet access are treated. Both services access the one Internet and as such should provide similar access conditions. Anything less will impact the use and growth of mobile Internet access – the platform that much of India is likely to be using to access the Internet in the near future.

To use a cloud computing application, there are fundamentally only two requirements – a web browser and "decent" Internet access. The first requirement is ubiquitous in most, if not all, modern computing devices – from PCs to smartphones to tablets. It's the second requirement which can be a stumbling block, for developing countries in particular. India is no exception – with barely 10 million broadband subscribers, very few of its population can presently derive and exploit the benefits of cloud computing to their full potential.

As such, India must address this issue of poor Internet and broadband penetration as a national priority. For a country the size and diversity of India, the Internet is a critical component to its socio-economic development. We already see various NGOs and organisations using ICT tools to empower people and to improve socio-economic conditions. Better, cheaper and ubiquitous Internet access can only help this along, and allow a larger part of the country to realise its full potential. This empowerment covers all imaginable sectors and issues – from agriculture to gender equality to culture and heritage preservation, from healthcare to delivery of government services to commerce.

Needless to say, policymakers have a key role to play in ensuring we realise this in a

The Many Faces of Cloud Computing

Cloud computing is still an evolving platform and is largely used to describe the delivery of various applications and services through a connected network. Cloud services can be delivered over a public network or within a "private cloud".

Software-as-a-Service or SaaS is the delivery of a web-enabled application to a user through a browser. Examples include CRM systems and office applications such as Google Docs.

Infrastructure-as-a-Service is the use of remote machine resources through the network usually on a dedicated basis. An example is a dedicated server at a datacentre or the use of remote storage and backup machines.

Platform-as-a-Service is a complete system made available over the network that can provide the necessary environment for either developing or testing an application or running the application itself.

The above represent three major categories being used, but are by no means exhaustive. Various iterations and derivatives have been developed as vendors identify market needs and position a service accordingly (or sometimes a bit of creative marketing comes into play). These include provisioning remote databases, running specific processes, testing and debugging environments, information management and systems management functions.

holistic manner. Here are some points that need to be considered from a policy perspective, and these are by no means exhaustive:

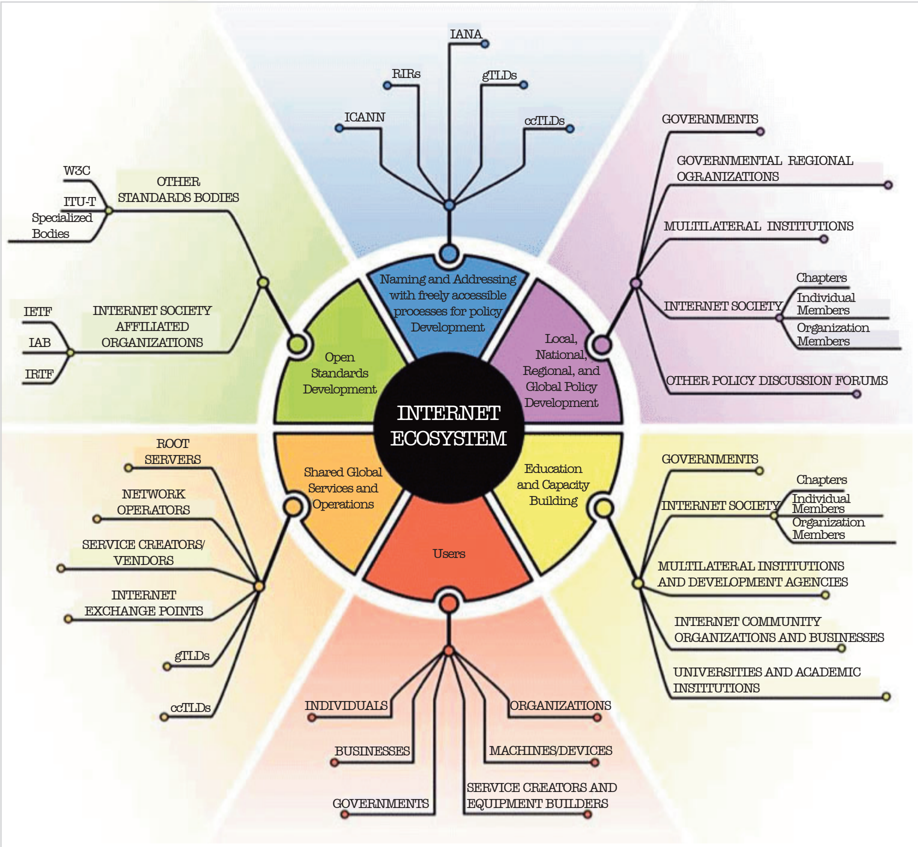
- There should be no geographic boundaries or centralised filtering imposed on the Internet. The Internet is what it is today because it has been allowed to evolve in an open manner, and keeping it that way will allow possibilities that we cannot even imagine today.
- The use of the Internet must be promoted and encouraged at all levels. A key factor is ensuring that schools and learning institutions make full use of the Internet and provide students (from primary to tertiary level) the ability to use and access the Internet. Today's students are tomorrow's future, and arming them with the right tools during their formative years will ensure they enter the workforce ready and able to exploit the benefits of ICTs.
- There must be concerted efforts put into lowering the cost of access – this not only means the cost of Internet access, but as well the cost of computing devices. Access to applications and content on the Internet should be equal for all.
- The establishment and growth of community-based wireless networks should be encouraged, and appropriate regulatory flexibility should be enacted to allow use of spectrum and the opportunity for self-sustainability of these networks.
- The mobile platform presents itself as a great opportunity for delivering much of the Internet's promise and steps must be taken to ensure this opportunity is exploited to its full potential by allowing innovation of services and applications for the mobile platform; the availability of 3G services at an affordable level for every citizen is key.
- Government must invest in centres of innovation and excellence to ensure India is at the leading edge of pioneering technology – not the lagging edge.
- Policymakers should promote open clouds and their effective use across various sectors; providing incentives for the development of regional, public operated clouds will also hasten deployment and use.
- As the Internet evolves, issues will arise that can impact its use; policymakers can help develop relevant policy frameworks to address emerging and future issues, and this should be done using a multi-stakeholder consultative approach.

The Internet Ecosystem

The reason the Internet has been so successful is perhaps due to its unique model: a shared global resource with shared ownership, open standards to drive its development and evolution, and freely accessible processes for both technology and policy development. Such an open and collaborative model allows all users to contribute to products and processes that drive the Internet's development in a transparent multi-stakeholder environment.

Graphic representation of the Internet ecosystem courtesy of the Internet Society www.isoc.org

The Internet Society (ISOC) is a nonprofit organisation founded in 1992 to provide leadership in Internet related standards, education, and policy with offices in Washington D.C., USA, and Geneva, Switzerland, and regional bureaus in Africa, Asia, Europe, Latin America and the Caribbean, and North America.



Graphic representation of the Internet ecosystem courtesy of the Internet Society www.isoc.org

With the rapid evolution of Internet technologies, the lines between voice, video and data continue to blur even more. This will present challenges to a variety of regulatory issues – is it going to be about regulating voice, or data services or broadcast services? Where are the lines drawn and how are they drawn? How are hybrid models of service delivery and consumption treated?

Needless to say, there will be even more pressure on service providers to deliver services. For the user, the need for speed will be greater than ever before – an ever-increasing need for more bandwidth to deliver new and feature-rich applications and services. More than ever before, the Internet will be the communications medium of choice for an increasingly larger part of the world.

Issues such as Internet security, stability, privacy, trust and the users ability to choose will be critical to the continued expansion and evolution of the Internet. These must be discussed and deliberated in an open, transparent and collaborative manner, involving all stakeholders. The concerns and issues of, amongst others, users and service providers alike must be considered. The sum of all these will be an important part of the enabling framework that ensures the continued evolution of the Internet and all the applications and services it enables, including cloud computing.

In the past decade and a half, the Internet has done much to transform the way we live, work and play - around the world and here in India. It has provided opportunities all around: educating us and entertaining us, helping us develop personally and professionally, allowing us to be in touch with near and dear ones in distant lands and sharing in their moments of joy and sorrow. It has brought us new and innovative ways of doing old things, and it has empowered us and allowed us to be truly global citizens. The journey continues...

References

http://campus.acm.org/public/pressroom/press_releases/2_2005/turing_2_14_2005.cfm
http://www.tec.gov.in/National-IPv6-Deployment-Roadmap.pdf
http://www.dot.gov.in/miscellaneous/task_force_nomination.pdf
http://en.wikipedia.org/wiki/Domain_Name_System
http://tools.ietf.org/html/rfc3696
http://www.isoc.org/briefings/019/briefing19.pd
http://en.wikipedia.org/wiki/Internationalized_domain_name#Top-level_domains_known_to_accept_IDN_registration
https://www.icann.org/en/announcements/announcement-2-15sep10-en.htm
http://en.wikipedia.org/wiki/Tim_Berners-Lee
http://www.unicode.org/
http://www.unicode.org/standard/WhatIsUnicode.html
http://www.internetworldstats.com/stats.htm
http://techcrunch.com/2010/07/09/ericsson-estimates-5-billion-mobile-subscriptions-worldwide-growing-fast/
http://www.internetworldstats.com/stats3.htm
http://www.trai.gov.in/WriteReadData/trai/upload/PressReleases/736/PressReleaseApril 2010.pdf
http://www.businessweek.com/news/2010-07-22/china-broadband-users-grew-57-in-1st-quarter-isuppli-says.html
http://infodev-study.oplan.org/the-study/folder.2006-02-02.6117616300/3-2-recognition-of-broadband-for-economic-development/
http://www.eda.gov/ImageCache/EDAPublic/documents/pdfdocs2006/mitcmubbimpactreport _2epdf/v1/mitcmubbimpactreport.pdf
http://www.oecd.org/dataoecd/62/7/40781696.pdf
http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weorept.aspx?sy=2007&ey=2010 &scsm=1&ssd=1&sort=country&ds=.&br=1&c=534&s=NGDPD,NGDPDPC,PPPGDP,PPPPC, LP&grp=0&a=&pr.x=81&pr.y=8
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Rajnesh D Singh is the Internet Society's Regional Bureau Manager for Asia, He is based in Fiji. An engineer by training and entrepreneur by vocation, he has consulted on communications and power infrastructure, project management and business strategy for medium to large companies and organisations in the Asia Pacific region. Rajnesh has also worked extensively with the Asia Pacific and international Internet community, and has held several leadership roles, including founding Chair of ICANN's Asia Pacific Regional At-Large Organisation (APRALO) and Chair of the PICISOC Chapter of the Internet Society. He has worked extensively on ICT policy, training and capacity building in the Asia Pacific region for UN agencies and private sector organisations. In 2008, Rajnesh joined the Internet Society to establish its Regional Bureau for Asia. He is also involved with a couple of Internet start-ups in the cloud computing and services sectors

Part II
The Pioneers

Chapter 3

Srinivasan Ramani

Bringing the Internet to India

Editor's Note

This chapter documents the early growth of the Internet in India via ERNET. It traces its roots to data communication initiatives at the National Centre for Software Development and Computing Techniques (NCSDCT), and the activities in which CMC, TCS, TIFR, Hinditron and Indian Railways participated. An early project was providing text feeds of news from Press Trust of India, which would find its way later to Usenet. Eight institutions (including IITs, NCST, DOE) co-operated to create the nationwide ERNET in the early 1990s, to further academic R&D. More than the technology that ERNET brought to India, it was the cooperative culture it promoted among national institutions. The entry of VSNL was a turning point for software companies and other non-academic users in India, as well as the setting up of specialised Internet access facilities by the Software Technology Parks. Emerging trends today include the rise of mobile Internet (the cellphone of today has a CPU and memory comparable to what a PC had a decade ago!), and cloud-based services.

What have ERNET team members all over India achieved? We set out to build India's academic network and succeeded in doing that. We did that as a nationwide academic coalition of eight institutions of higher learning and R & D. Working together to win gives you a high, as all sportspersons know. So, how we did it was as important as what we did. In the process we brought the Internet to India.

This is a subjective view of a small but important part of the IT Revolution in India - the arrival of computer networking and the impact it made on many aspects of our lives. It was part of something bigger – electronic and digital revolution that brought us computers and a plethora of communication facilities.

I had the pleasure of having an early introduction to electronics and communication as a high school kid in the early fifties. A friend of mine, Mahadevan, and I used to haunt second hand bookshops to buy used copies of Popular Science and Popular Mechanics magazines. This led to a fascination with "crystal radios" that could be built for INR15 in those days but after several visits to the Moore Market in what was then the city of Madras (now Chennai). The heart of the crystal radio was a small stone-like crystal glistening with its Germanium content. It sat in the metal cup of a broken torch light bulb. A bent wire made precarious contact with it. This was our homemade diode! I built a regenerative one-tube radio receiver the next year. Not surprisingly, I went on to study Electrical Engineering for my Bachelor of Engineering degree and Electronics for a Masters.

Then came five years of work and study during the sixties at the Tata Institute of Fundamental Research (TIFR), earning a PhD and getting deeply involved in the science and technology of computing. There was the magic of software and the grand ambition of artificial intelligence.

The Seventies

I did a couple of years of research at the Carnegie-Mellon University (CMU) in Pittsburgh as a post-doc during 1971-73. That is where I encountered email and learnt about the pre-natal developments of what has now become Internet technology. The Advanced Research Projects Agency (ARPA) had funded the creation of the pioneering network, ARPANET. CMU was a node on this network and so I became one of the first few hundred users in the world of computer networks and email. The fact that one's terminal was a rickety old teletype that went clack-clack at 110 bits per second did not discourage anyone. One could also "telnet" into computers in other cities, but this turned out to be a minor attraction in that period except for my friends in the physical sciences. Intercity email was used mostly for science and technology communication like for asking authors for their reprints, in fact their e-prints, though the term was invented only later on.

One of the considerations behind the creation of ARPANET had been the fact that packet switching networks are resilient against failure of equipment and communication links. That meant that packet switching does not need a perfect communication system, as long as there are communication links even if they are noisy (error-prone). It would make up for weaknesses of the underlying communication network. Secondly, there was the magic of message switching. You don't have to suspend what you are doing and run to your computer terminal the moment an email arrives as you rush to the phone when you receive a phone call. Email gets stored somewhere and waits for you to log in at your convenience. Packet switching nodes, basically what we now call routers, handle noisy communication links well. If an information packet does not get through properly, the receiving end complains to the sending node that packet number x was not received. The sending node makes up by sending a copy of x. I recognised that a developing country like India needed this technology very badly; there was no doubt about noise on our communication links. Our communication network was growing day by day. As new communication links come up, it would be easy for routers to recognise the new resources automatically and start using them. The routers resemble "intelligent" controllers in their ability to do the right thing at the right time and to coordinate with their neighbours, without obeying a master in an engineering bureaucracy.

The excitement with these ideas was enough to make me decide that my first love from then on would be computer communication. The old flame of artificial intelligence (AI) and its educational applications continued to get some share of my attention. I did not feel there was anything wrong in this switch of affection. Networking was highly relevant to development at the national and global levels. Computer communication was soon to prove its great value as a tool for communication and information sharing in the academic world. AI was an affair for the long term.

I returned to India in 1973 and got involved with the National Centre for Software Development and Computing Techniques (NCSDCT) that was coming up at TIFR, under the leadership of Prof R Narasimhan. Prof M G K Menon[1] , then Deputy Director of TIFR, was an enthusiastic supporter of NCSDCT. The 'intelligence' of modern networks is a phenomenon created by software handling complex situations in appropriate ways, going beyond anything that hardware alone could. So, we created a place in the NCSDCT's plans for work on computer network software.

This was the era of self-sufficiency and development of indigenous capabilities. The Electronics Corporation of India Limited (CIL) was building mini-computers – TDC-12 and TDC-316. NCSDCT was funded by the then Department of Electronics, Government of India. So, it was natural for me and my team to use the TDC-316 for our experiments in computer networking. We felt that the TDC-316 could run as a remote station for the Digital Equipment Corporation's DEC-1077 that served NCSDCT and TIFR as the major computing facility. The remote station could be located anywhere that was reachable by a telecom leased line. Dial-up had not been heard of in India by then.

DEC had defined a protocol named the Digital Data Communications Message Protocol (DDCMP). We decided to use it for creating communication software for TDC-316. My colleagues, Anant Joshi and, Vinod Kumar were involved in this effort and soon the TDC-316 based remote station was a reality, based on communication software developed at NCSDCT.

The remote station was moved to the then Victoria Jubilee Technical Institute in 1976 and commissioned. It was connected by a leased line from what was then Bombay Telephones, and provided with a card reader and printer. Online terminals were added on at a later date. This extended TIFR's computing facilities to Veermata Jijabai Technological Institute (VJTI). The remote station was used heavily in a one year post graduate programme on computer applications from 1977. This course later morphed into the Post Graduate Diploma course in Software Technology run by the NCSDCT and was conducted at VJTI for a number of years. In time, this became the model for many other post graduate diploma courses that came up in the computer field all over India. We attracted the best and the brightest participants, as we were the only show in town in this field in part time education!

Prem Prakash Gupta PPG, then Managing Director, Computer Maintenance Corporation Ltd. (CMC) used to be a frequent visitor to the NCSDCT. He was a visionary who encouraged people to take on ambitious R&D projects. In 1977, I reviewed the proposal from abroad received by an Indian entity for a message switching system worth crores of rupees. It involved specially built fault-tolerant hardware and used old software technology. I felt that we could do a lot better using new technology. One could use minicomputers that were being mass produced, were simpler and more rugged than old hardware. We could build communication software written in a higher level language to run on top of such hardware and a real time operating system (OS), and create our own message switch. Such a system would cost a fraction of the foreign product, though it would use an imported minicomputer and real time OS. The communication software would be easily maintainable and the source code would be the property of the Indian entity that created it. Driving me was the firm conviction that store forward message systems were going to be important.

PPG[2] readily agreed to launch this as a CMC project and constituted a small CMC team, headed by SG Wagle, to work with us. Mr. KVS Prasad and I constituted the NCSDCT team. We had the right minicomputer required and the real time OS. Besides, we were excited about Pascal and decided to use it as the language to develop the software. What about an application? I felt that a real world test bed would be necessary and approached P Unnikrishnan who was then the General Manager of the Press Trust of India (PTI). Here again we got ready acceptance of the proposal; CMC bought a mini to be located at PTI and created a work area there suited to running a 24 x 7 computerised operation. The higher level language, Pascal, enabled code to be created very quickly. A prototype was running in ten months. It used PTI's few dozen Telex channels from many cities to provide input, and handled online editing and automated transmission to subscribers all over India. CMC's investment paid off very soon; PTI decided to computerise its system completely and placed an order on CMC.

CMC's projects of that era demonstrated that using imported computers was a valuable idea. What mattered was not so much the building of hardware but creating very relevant and important applications. They taught those involved that Indian technologists stood to gain by standing on the shoulders of worldwide technology, and not by running a me-too operation!

Soon after this, one of the world's leading message system companies approached Tata Consultancy Services Ltd (TCS) to see if a new technology message switch could be created for them in India. NCST had the pleasure of joining TCS colleagues to present to the customer what had been done in India and to tell them that NCST's facilities would be available to TCS for the project if they were to get the order. TCS did get the order and used NCST equipment to implement their own message switching software meeting the needs of its customer.

We became more ambitious after these successes. The Indian Space Research Organisation (ISRO) was planning a communication satellite named APPLE, and in 1978 the NCSDCT team in computer communication was invited to propose inter-city computer networking to be demonstrated using the facilities provided by this satellite. The team had been following early experiments in running packet-switching networks over satellite channels conducted by US and British scientists. Prof. Norman Abramson, credited with the invention of the first contention protocol[3], ALOHA, had visited NCSDCT to give a short course on computer communication using wireless media.

The proposal for a Computer Network Experiment (COMNEX) was the joint creation of three entities, NCSDCT, the Space Application Centre (SAC), Ahmedabad, and the Telecom Research Centre (TRC), Delhi. NCSDCT brought software and networking protocol know-how, SAC and TRC satellite communication know-how. The proposal was quickly accepted and we were off to a flying start. Working on a small budget, we ordered motherboards to build three low-end minicomputers, created a real-time monitor, and chose to write our software using a framework named Communicating Sequential Processes. This was our first experiment with a message passing architecture. We wrote a compiler for the language we used. Again, my colleagues, Anant Joshi and Vinod Kumar implemented the software. Simultaneously, we began work to build an earth terminal; a couple of decades later, we were to jokingly refer to it as the world's largest VSAT (Very Small Aperture Terminal). A small two-storied octagonal tower was built to house the 20′ antenna that was to be created by the TIFR Workshop. It also housed the satellite communication equipment built by SAC. This tower sat in the TIFR garden behind the Home Bhabha auditorium. By 1979 standards, an antenna 20′ in diameter was a small one to communicate with a communication satellite operating in the extended C-Band[4]. TRC committed to design and build a 32 kbps modem. The modems running on our leased line to VJTI were initially 1200 bps ones, getting gradually replaced over the years by 4800 and 9600 bps modems. The 32 kbps satellite-channel modem was like a hot rod in comparison. SAC gave us their design for the 20′ antenna and we proceeded to build the antenna in the TIFR workshop, buying tons of steel and aluminium for the purpose. The parabolic surface had to be accurate to the design within millimetres. A big crane had to be borrowed to hoist the parts on to the terrace of the tower for installation. Meanwhile minicomputers built using the motherboards had been housed in three hand-crafted wooden trunks complete with small fans. I suspect that each box weighed over 30 kilos when everything, including the power supply was installed in it. One box each was shipped to SAC and TRC. Much to our surprise, all these unbelievable contraptions soon got to work. Months of hard work had gone into this effort, but it was still amazing to see such a complex, home-made network operate using three nodes in three different cities. In October 1980, SAC organized a special symposium to demonstrate the network to over a hundred participants.

Early Network Applications: Three of us came together to run Networks-80, the International Symposium on Computer Networking, run under the banner of the International Federation of Information Processing – PPG of CMC, Hemant Sonawala, Chairman of the Hinditron Group and myself. As far as I know, this was the first international conference in a computer related area in India. We set an ambitious goal for ourselves – to demonstrate that computer networks can contribute significantly to our developing economy and to improvements in the quality of life of the average Indian. We planned three major demos: a prototype of a railway reservation system, an email system and an overseas demo of the pioneering Prestel system developed in the UK. My colleagues at the NCSDCT, P Sadanandan and his associates developed the prototype railway passenger reservation system and the email system. V S Rao played the central role in developing the email system that was demonstrated on the DEC-10 computer system at the NCSDCT. It could be accessed remotely over a data link equipped with modems. Prestel[5] was demonstrated using a remote link from Mumbai to London. Michael Miller from British Telecom gave the demonstration and presentation. The railway reservation system prototype demonstrated could not use live data from Bombay, Ahmedabad and Delhi as planned originally; a high level officer in Railways who had been interested in the project had retired. However, all three demos worked their magic, convincing a number of organisations and professionals about the feasibility of implementing full-fledged projects of this type and the potential benefits of doing that. It is worth noting that Prestel carried the seeds of the World Wide Web, which was to be conceived over a decade after 1980 when Networks 80 was held.

The wheels of Railways grind slowly but surely. In 1985, they accepted PPG's proposal for CMC to implement a full-fledged railway passenger reservation system for the Northern Railway. A year later, Railways asked CMC to extend it to other major cities, which it did making the first major IT contribution to the quality of life of the average Indian. CMC also went on to implement a wide area network named the Indonet in 1986.

Whatever I had learnt about satellite communication from ISRO colleagues led me to dream of many things. One of these resulted in a proposal for a new form of satellite named the Low Altitude Data Satellite primarily to carry email. This proposal was created by me and a colleague, R. Miller, during the few days we were together attending a Workshop organised by the International Development Research Centre (IDRC) in Canada.

If the distance between two communicating locations was more than 2,000 kilometres or so, the low altitude satellite may not have line of sight to the source as well as the destination at the same time. In that case, it would store the email from the source in an onboard memory and “carry” it physically to a suitable place from which it could be transmitted to the destination. Our proposal also included a provision for the use of a packet switching protocol to provide online connectivity between two locations, which could have simultaneous line of sight with the satellite. If one of them was on a packet switching network, like the current Internet, the satellite would provide the “last mile solution”, that is connectivity between an end-user location and a suitable node on the network. As the satellite went round the earth in one and a half hours or so, there would be periods up to 20 minutes long during which it would have simultaneous communication with a user and an earth terminal connected to a computer.

National Centre for Software Technology (NCST): This centre was created by a core team coming from the NCSDCT at TIFR. One of the three major areas that NCST had chosen to work on was Computer Networks and Real Time Systems. I had the privilege of being the Director and the Head of the Networks and RTS Division. NCST had chosen to put its bet on the Unix operating system (OS), and became the first organisation in India to run a large computer (VAX-8600) on Unix. The VAX-8600 came with its own OS named VMS, but NCST canned this VMS OS, and used Ultrix instead; Ultrix was DEC’s adaptation of Unix. This choice was to make a major impact on networking activities in India in the late eighties and early 90’s, for Ultrix was based on the public source BSD and included the suite of computer networking software developed in the US for Unix. So, our team had a head start in adopting the technology that was to develop later into Internet technology. Software to handle synchronous and asynchronous data links, to run an email hub, and to use the TCP/IP protocol to create wide area networks was all there in Ultrix. In fact, we had bought the source of BSD Unix for US$ 70 or so, the cost of handling and shipping. This was roughly in 1985-86.

Education and Research Network (ERNET): I had written a proposal in 1983 saying that India needed a nationwide academic network and appealed to the then Department of Electronics (DoE), Government of India, to launch a project to do this. Colleagues at IIT-Delhi had also written a proposal to enable academic networking. Mr. Prem Prakash Gupta had been appointed Secretary to Government of India by that time. Being very familiar with applications of computer networks, he gave his ready blessing to the proposal. Mr. S Ramakrishnan, a young officer at the DoE at that time, got involved in DoE’s efforts to seek funds for it and to launch the project. The United Nations Development Program (UNDP) was requested to give assistance to the project and they acceded to this request. Young faculty members at five IITs (Bombay, Delhi, Kanpur, Kharagpur and Madras), and at the Indian Institute of Science, Bangalore, who had expertise in this area were invited to form a core team along with Ramakrishnan and myself. In the beginning, an experienced communications specialist, a former Deputy Director General, Telecom Department, Government of India, on deputation as Joint Secretary, DoE was in charge of the project’s administration.

Ramakrishnan was an alumnus of IIT Madras and thought and behaved like an academic staff member rather than as a bureaucrat. With his support, the eight institutions involved (the six mentioned above along with NCST and DoE) cooperated to create the nationwide ERNET. More than the technology that ERNET brought to India was the cooperative culture it promoted among national institutions. Coordinators[9] at the eight institutions dealt with each other as collaborators, and did not have any hierarchy weighing them down. They brought the biggest strength of these institutions to the ERNET project, their fast-learning and enthusiastic bands of students and young professionals.

ERNET aimed at furthering network R&D in addition to creating an academic network from the very beginning, though I am not going to cover this part of the work in much detail in this chapter. R&D funding was given by the DoE for this purpose. Many of those who carried operational responsibilities also carried R&D responsibilities. The NCST team developed an X.25 PAD very early in the project and successfully transferred the know-how. Concepts such as that of an adaptive contention protocol and a packet broadcasting system were developed for use over satellite channels. There was also theoretical work on encryption and computational complexity.

Connecting to the Internet

The year 1986 saw a dial-up link running UUCP for email exchange being established between NCST and IIT-Bombay. 1987 saw IIT-Madras and IIT-Delhi connecting to the NCST VAX 8600 by dial-up. This machine became the dial-up hub named shakti.ncst.ernet.in[10]. Very soon all ERNET partners were on dial-up ERNET email and hundreds of Indian academics in these institutions started using email to talk to colleagues all over the world, using a dial-up link between Shakti at NCST and a router at the Centrum voor Wiskunde en Informatica (CWI) in Amsterdam. A member of the ERNET team at NCST, Anil Garg, played an important role in Internet-related activities at that time. We had earlier found him a UNDP Fellowship which took him to the University of Wisconsin at Madison. The Internet-related experience he gained there came in handy for the NCST team. Shrikumar, who joined NCST at about this time, also played a significant role. Mr. Bharat Desai and his team contributed in a big way, handling set up, installation and maintenance of hardware and software. Sanjay Pathak, with his dedicated colleagues, took on full responsibility for 24 x 7 operation of the hub. This experience has resulted in his playing a key role in a number of ISPs later on.

CWI was a big international hub for email and had good connectivity to a number of countries including the USA. India had arrived on the Internet in 1988, though the umbilical cord was working at only 4800 bps. Interesting things started happening. NCST used to work with the Press Trust of India on R&D projects. One of them involved archiving PTI news flow and carrying out intelligent information retrieval to get news items as required. There was a Telex link from PTI to NCST that gave us online news. With PTI's permission, we arranged for posting of selected news items on a Usenet newsgroup named soc.culture.indian. This was valuable to the Indian Diaspora all over the world.

F-Mail: Have you ever used F-mail? Well, the opportunity to do so may never come your way. In the late 80s, ERNET expanded its email system to cover more and more locations with educational institutions. IIT-Kanpur (IITK) is well known as a pioneering institution in computer science education in India; it was also a full partner in ERNET. However, there were problems in reaching IITK with email. It was difficult to get a leased line. Dial up did not work well as the telecom system in Kanpur needed upgrading. So, colleagues at IITK and we at NCST tried a desperate solution. Write out email files on floppies[11] and send them by courier! At IITK these files would go online and users on the IITK LAN could read them and reply; they could write their own emails too. These emails came out of IITK on floppies again. After a trip by courier to Bombay, they would go online again and travel over the network to wherever they were addressed to. It was exhilarating to have IITK on email, particularly for IITK alumni living abroad and for IITK academics with colleagues abroad. The system served its purpose, but soon there were some complaints! Why did email take two or three days to reach IITK? The complainants soon found out why and there was an uproar. IITK did not have a network connection? Whose fault was that? This uproar served a valuable purpose and soon there was a working leased line to IITK.

The international dial-up link cost lakhs of rupees, but Ramakrishnan was managing to get funds allocated to the ERNET project to keep it in an expanding phase. Of course, we had to find less expensive options soon. The one that became available to us at that time was a dial up link to the X.25 network at VSNL over which we ran a TCP/IP link.

The bandwidth available over the link to the X.25 network was not very much. So, the next step was to acquire high-speed dial-up modems to connect to the US directly; that meant speeds of 9600/19200 bps at that time - we mostly used it in the 9600 setting to keep the error rate low. These modems made it possible to connect ERNET to the UUNET hub in Falls Church, VA, USA; this link was good enough to run the email exchange protocol UUCP. Then we moved up in 1989 to an analogue leased line working at 9600 bps connecting Shakti to this UUNET hub.

Why not a few leased lines among ERNET partners in India? This became a reality in 1988, starting with links from Bombay to Madras and Delhi. Initially, ERNET was using no routers – workstations handled the Internet gateway function. However, ERNET funded all its partners to develop LANs and routers got installed. The line to USENET was converted to a digital link operating at 64 kbps in 1992. The link was leased at what appeared to be exorbitant cost at that time – Rs 16 Lakhs per year! But it gave India "good quality" TCP/IP connectivity with the world, over a massive 64 Kbps link.

I have used the phrase "ERNET Partners" so far to mean only the eight institutions that had started the ERNET project as a group. However, as they started linking up, it was time to share infrastructure with other academic and research institutions. The International Centre for Astronomy and Astrophysics (IUCAA) in Pune was one of the new institutions to connect to ERNET. TIFR followed very quickly and more and more institutions started connecting up. At the peak, dial-up links shot up to a few hundred all over India. Slowly some of them also acquired leased lines, and went on to support dial-up subscribers in their own cities and their neighbourhoods.

The rise of the Internet in India was more or less in the same period during which the Indian software industry pioneers were making their mark. The government saw the potential of the software industry. Mr. N. Vittal, then Secretary to Government at the DoE, and a few other administrators were very highly supportive of both developments. A piquant situation arose when the fledgling software industry badly needed email and there were no Internet Service Providers (ISPs), public or private. ERNET informally started giving email facilities to the software companies. A wrong person above us could have put a stop to this very quickly saying we had no right to do so as we were only an academic network. Instead, Vittal was supportive. DoE was funding the ERNET, and was at the same time carrying the responsibility of making the software industry grow. So, when we briefed him with some timidity about ERNET giving support to software companies, he made it clear that it was the right thing to do. We were afraid of trouble with telecom department. These were very tough days; if multiple landlines were to be terminated at an institution, that institution could not create a network out of them. They were to be used only as point to point lines. At the beginning, when the hub served only as an email hub, we had a fig leaf – there was no level 2 or level 3 connectivity between the connected institutions. Instead there was only a store-forward message system named an email relay computer connecting them. This was dangerous – the whim and fancy of one officer could have pulled the carpet from under us. Vittal re-assured us; the government had decided to give priority to the growth of the software industry, and this industry was vociferously in need of the Internet.

The Impact

If the software industry was very keen to communicate over the Internet, scientists also showed a lot of enthusiasm. In particular, information over the Internet, now over the Web, has been mother's milk to physicists. Some of us have joked that physics in the current era is one of the applications of the Internet. To be fair to physics, we should not forget that the World Wide Web was invented by a computer specialist working in a physics lab. I have always enjoyed working with physicists to enable their institutions get the most out of Internet connectivity. Having said all this let me confess that nothing prepared me for the frenzy that was to attack physics groups in 1989. Fleischmann and Pons, then researchers at the University of Utah, had announced that nuclear fusion had been realised without the need for extremely high temperatures. What followed over the next six months was unbelievable excitement about this possibility and an enormous thirst for immediate access to information. Lumbering old journals could not keep up to the speed required, and the Internet filled in the need. Some jeep or car was often seen parked outside NCST while the driver waited for ERNET colleagues to dig out relevant material from newsgroups and print them out for his Lab. Unfortunately for us, the bubble burst in about six months and cold fusion died. Doubts were expressed about the reality of the phenomena reported. But it had been great while it lasted. There were so many more influential people now to tell the government of the necessity of academic networking.

There were others excited about information over the web. During the mid-nineties a medical doctor from the Nanavati Hospital in Mumbai wanted to print about ten pages each for over a hundred types of cancers then known and make a small booklet for each type of cancer, to give patients at his hospital. The attraction was information on new developments in cancer treatment. He needed Internet-based information that was in some cases less than two weeks old: new drugs, new treatment protocols and so on. Protocols were no doubt important to us in the computer networking world, but our protocols were no match to the doctor's lifesaving protocols.

There was an impact on my family too. My wife Usha had been unwilling for a couple of decades to come within five feet of a terminal or a computer, but things changed when my daughter went to the US for studies in 1993. In those days, we could not afford overseas calls; so, within a day of landing, my daughter got her email account and reported that she had had a good flight. Usha promptly demonstrated that you can learn email usage within 30 minutes if you had a reason to do it. Soon after that I started using talk to keep in touch with my daughter, and even to regularly discuss topics in her courses she found difficult. I bought one or two textbooks of hers for reference at my end, and started referring to her as my daughter on the net. I had become a teacher on the net, which is what I hope I will be for a thousand students or more in the future[12].

About this time, I had a visitor at NCST – Col BK Rai, Founding Chairman of HCL and many other companies. He had come for a review, and I had set up an Internet demo for him. An enthusiastic student volunteer somewhere in the US had agreed to be awake at what was an unearthly hour for him so that I could give a "talk" demo. I was excited with the demo and Col Rai was very interested. When it was over, he put a hand on my shoulder and said, "I know how you feel, Ramani!" and went on to tell me about the time he had been a student in Benares; it must have been in the forties. He used to operate an amateur radio set up from his hostel room which did not even have a cot to sleep on; there must have been a mattress on the floor. He was frequently in touch with one Louis over the amateur radio channel. One day he noticed that the signal strength of Louis' transmission was much higher than usual, and enquired. Louis told him that he been in Ceylon till then and had moved to Delhi a little while earlier. He asked where Rai was located, and said that he would like drop in when he was in the area. This was all forgotten till one day, when all hell broke loose! The Principal called Rai and demanded to see his equipment. Rai was told to take it to the physics lab or some such place, more dignified than the hostel room. The trouble had been caused by the District Commissioner, or Collector, who had informed the Principal that Louis Mountbatten, then Viceroy of India, had written saying that he would like to visit Rai when he was visiting Benares. So, that is what some forms of communication technology do – a humble student could talk to the Viceroy as an equal. Even now, anyone can send an email to Vinton Cerf, the father of the Internet, and get a reply usually within minutes.

The Internet is of special interest to information professionals working in libraries and in university departments of library science. Their profession was faced with unprecedented challenges and opportunities with the arrival of the Internet and the World Wide Web. NCST initiated a project named the Bombay Library Network (Bonet) with funding from the Department of Science and Technology, Government of India. Starting in 1992, Bonet offered training in Internet technology to librarians and library staff and supported libraries in connecting up with ERNET. However, the dream of library networking of that era involving the creation of an inter-library network in each metropolitan city to promote inter-library loans did not get very far. Libraries with considerable resources had little to gain from libraries that had very limited resources. This asymmetry made centralised coordination of resource sharing very difficult. However, it is worth noting that Delhi went farther towards success in resource sharing as compared to other cities.

The turn of the century saw the University Grants Commission deciding to fund a network (named the UGC Network - UGCNET) to offer Internet facilities to every university it supported. Naturally UGC decided to invite ERNET to handle the technical responsibilities in setting up this as a sub-network and to handle the network management function. An inter-university centre, INFLIBNET in Ahmedabad, was charged with the responsibility of planning for this network, working with ERNET, to coordinate with the universities involved, and to manage the funds necessary. I had the pleasure of serving as the Honorary Chairman of INFLIBNET for three years, during the crucial period of setting up UGCNET.

TCP/IP: I think it was around 1990 when ERNET started running TCP/IP on its domestic leased lines. The network could do more than merely handle email. But the bandwidths were small and links were initially only analogue leased lines. It took a while to get digital leased lines for domestic use. We were running interesting applications such as “talk”. Online information access over the Internet was supported by the application named Gopher, which became available in 1991. It was good for running on text-oriented terminals, which we had been using and required only a small amount of bandwidth. It allowed us to locate and fetch documents over the Internet. I should confess that I was so enamoured of it that when the World Wide Web attracted considerable attention over the Internet in 1993, I was quite reluctant to switch to it.

Challenges with the Telecom Infrastructure

In the early nineties, you could be twenty miles away from the city centre and be told that there was no “technical feasibility” for a leased line. This was before the telecom department was to find data communication a significant demand and train its technical people to handle that demand. You can imagine an assistant engineer meeting an application for a leased line for use in data communication for the first time in his life. Even if he could give you a leased line, its uptime was usually a concern. These strange connections were not always handled well at the exchanges – wiremen would often disconnect them as they made no sense to them.

Intercity bandwidths were also a problem. We had to be accommodated on congested microwave channels. The era of abundant optical fibre connectivity reaching every taluk town was only a dream at that time.

The work of the NCST team on satellite-based data communication more than a decade earlier came in handy for expanding the ERNET to locations beyond the reach of leased lines. I had the pleasure of heading a Committee of ERNET colleagues tasked with planning a satellite-communication based system for offering connectivity to the network. The project acquired and set up in 1994 a hub for this purpose in Bangalore, with assistance from UNDP. VSATs were set up in many locations such as Birla Institute of Technology and

Science (BITS), Pilani, giving Internet connectivity. Being located in the same premises as Software Technology Park in Bangalore and operated by a DoE team set up for this purpose, this hub started playing a major role as an ERNET infrastructural facility. It provided a leased line with good bandwidth to the ERNET node at the Indian Institute of Science (IISc) which started playing a significant operational role. Simultaneously, the ERNET team at DOE, Delhi, had built up its staff strength and acquired an overseas leased line. The NCST hub was no longer the only hub on the ERNET, though it continued to maintain the overseas link it had been operating. We, at the NCST, now had time and energy to do other things, such as taking the technology to industry and business (see a later section on this topic).

The entry of VSNL, which was then a public sector company, as a provider of Internet Gateway Service in 1995 was a turning point for software companies and other non-academic users in India. The setting up of specialised Internet access facilities by the Software Technology Parks under the DoE was another major development. This was followed up in 1998 with the Government announcing a policy that allowed for setting up of private ISPs. A committee headed by the then Chief Scientific Advisor to the Prime Minister had looked into certain technical issues preparatory to the decision to allow private ISPs. The Secretary to Government, DOE, had asked me to work with this Committee. So, I had the pleasure of working with a charismatic leader over a few Committee meetings – Abdul Kalam. His keen interest in the technology of the Internet was an inspiration. I also wish to thank him again now for the memorable masala dosa lunches he gave us in his cabin!

Challenges Faced

Living under rigid regulation: Doing technology R&D even in government funded organisations is difficult. India, during the seventies and eighties, was not one of those countries in which innovation was recognised as central to growth and promoted. Regulatory policies usually aimed at control rather than promotion. These policies were in some cases handled by government entities that had an interest in protecting the income from their own operational activities and had a monopoly over their sectors. In 1980, in a panel discussion at the International Conference Networks-80, a question had been raised from the floor: why were dial-up connections illegal? The reply from an official of the concerned government department was illuminating. He said that the government could not allow its substantial revenues from Telex be threatened by dial-up. He said that they were concerned that dial-up modems would be manipulated to send signals at higher than allowed signal levels, thereby disturbing telephone users through cross talk. Instead of dial-up, they were going to give a 300 bps datacom service using their Telex network and that should be good enough for us. As far as I know, the 300 bps Telex service never got off the ground in India, but the NCST team quickly connected our Telex line to our computer and we started to send and receive email though a gateway that was operated in the US by Western Union, giving us the first overseas email connectivity; this was in the early eighties.

A few years later, we had another senior government officer at a meeting organised by the Bombay Chamber of Commerce answering another telecom question: when would the use of TCP/IP protocols be permitted over leased lines? The answer was that there was no question of their being allowed – they were not international standards and were competing with the international standards that India was adhering to, the good old CCITT standards. Later on, in the eighties we planned to work on using VHF for data transmission. Getting a frequency for research was not easy. It took months and a few trips to the concerned office in Delhi. One officer told me that even Ahmedabad Police had a request turned down due to lack of spectrum. The transition from lack of spectrum to lakhs of crores (1 lakh crore Rupees is 1012 Rupees.) for spectrum, therefore, amuses me a lot. The lack in those days was due to the unwillingness of certain government departments to release unused spectrum. When you applied for a frequency to be allotted, they made more than thirty copies of your application and sent it to an equal number of 'users' mostly within the government, for a no-objection certificate. There was a different kind of issue with respect to satellite data communication in the early eighties. There was a compulsion to use Indian made equipment even for research. Datacom equipment was available to Indian users for use only on the extended C-Band that India had decided to stick to. As a result the antenna required was a mammoth one when compared to the much smaller antennas that now support stockbrokers carrying on online trading in many places. Getting clearances for setting up satellite links was a major operation.

Protocol Wars: The frustration with regulatory agencies banning the use of new technologies continued into the late eighties. In the context of the ERNET, we wisely avoided getting trapped into protocols and technology, which were going to lose, and put our bets on Internet technology six or seven years before the World Wide Web was conceived. IP and TCP/IP were cornerstones of our technology, though the concerned government department continued to reject them as not being international standards. We worked quietly, like a resistance movement, to survive restrictive telecom policies and lack of good telecom infrastructure in many places. We even survived the period during which a Department of Telecom DDG on deputation headed the ERNET project. Many of us diplomatically avoided spending a few years of our lives on OSI Protocols, which were competing with TCP/IP and related Internet protocols.

Controversies over domain name registration: As the first entity in India to ask for an Internet connection, the NCST team of ERNET was invited to function as the domain name registrar for India. Domain name registration was handled through informal international coordination. Government departments and corporate entities had not felt it necessary to worry about it. NCST accepted the responsibility, with the support of ERNET, operating it informally under the project. It was treated as a public service and was offered at no cost. But complexities surfaced soon enough. Should we not foresee possible problems arising from someone being given a domain name such as IndianRailways.com though they were not representing Indian Railways? This was not our concern as .com registration at that time was handled outside India; our responsibility and authority were limited to the .IN domain. The version of the question that we would have faced is: could we give the domain name IndianRailways.co.in to anyone who may apply for it?

As a national entity, funded by government, we were accountable to the law for the policies and practices we followed. We applied our mind to it and decided that legal precedence existed in the form of Trademark Law. You had to show that you were not infringing on someone's right by demanding a domain name that could mislead users to think that you were representing someone, when you were not doing that. So, if you wanted a co.in domain name, our policy demanded that you produce documentary evidence to show that you were working on behalf a company the name of which (or its abbreviation) formed part of the domain name. If you wanted an ac.in domain name, you had to show documentary evidence that you were a recognised academic entity with the related name. Many people resented this and pointed out that anyone could get a .com domain name as long as it had not been given to someone else at that time. They said that we were bureaucratic and that we were inhibiting growth in the number of domain names registered under .in.

There were other disputes; our policy did not permit giving someone a domain with a generic element in it. We would not have given you burfi.co.in as you had no monopoly over the name burfi! Fortunately for us, no Mr Burfi turned up asking for a domain name!
Taking the technology to the economy.

The nineties saw tremendous interest on the part of industry and business to use Internet technology. Several decided to set up corporate networks for their own use. The technology enabled an organisation such as an oil company or a bank to link up at least its important offices to a network to use centralised computing facilities whose function included the aggregation of information and superior management. It was quickly recognised that the best way to do this was to support online transaction processing centrally. Stock exchanges found it absolutely necessary to permit online trading. Myself and several NCST colleagues, including Bharat Desai, Anant Joshi and Anil Garg had the pleasure of serving as consultants to make corporate networks a reality in a number of industries and businesses. All of them have used Internet protocols and standards. I will give a few examples of projects in which we played the role of consultants, making a contribution to the design of these networks and supervising the implementation. Oilcomnet was created to serve the oil industry, connecting petroleum companies. A number of banks such as Dena Bank and Union Bank of India created their own networks. Some of the bank networks created were voice-cum-data networks, using Voice over IP (VoIP). The Bombay Stock Exchange (BSE) implemented a nationwide network to permit online trading over satellite channels serving thousands of terminals. In addition BSE implemented a large LAN and a network of leased lines to provide high speed connections to stock brokers who needed them. A special privilege was to serve as consultants to the Mahanagar Telephone Nigam Ltd (MTNL) when they decided to become an ISP and planned their network.

Conclusion

What have ERNET team members all over India achieved? We set out to build India's academic network and succeeded in doing that. We did that as a nationwide academic coalition of eight institutions of higher learning and R&D. Working together to win gives you a high, as all sportspersons know. So, how we did it was as important as what we did. In the process, we brought the Internet to India. We trained hundreds of young people, some as students and some as young colleagues, who shared the workload with us. So, we were able to help build up a large body of well-trained professionals who played their own role in bringing India to the era of the network, which was essential to the development of the software industry.

There is a stupid statement frequently made that Indians do not pull together, but pull each other down. My ERNET experience has shown me that this is untrue where there is effective leadership and adequate incentive to cooperate. Given top government functionaries such as N Vittal, government colleagues such as S Ramakrishnan, and highly supportive managers like T R Maakan of UNDP, our teams of academics and R&D staff got the best management we could have asked for.

India has its own strengths: a young population that learns whenever it gets a chance, a high population density and a low cost service economy that makes communication-based services very efficient. The speed with which Indian banking and capital markets adopted network technologies is proof that given the right leadership we can go a long way. It is worth mentioning here the role of N Vittal in promoting technology in the banking sector in his second avatar as the Chief Vigilance Commissioner (CVC). I do not know of another country in which someone like the CVC has ordered banks to computerise and to connect up, to prevent delays in settling accounts and to prevent fraud. What he had learned in his years in IT and telecom he used with great effect in banking, making a significant contribution to the economy. But for his foresight, we would have had bank scams in plenty!

Challenges ahead: Let us look ahead and see the challenges we face now. Where are we in India today with respect to widespread applications of network technologies? It is a common thing for enthusiasts to focus on technology and miss the boat – appropriate applications. How much do we use the Internet to promote education and healthcare, apart from their routine use in institutions of higher learning and engineering colleges? How much of the content that we consume do we create? How much local innovation do we encourage? Cellphone enthusiasts are excited by the fact that millions of phones can potentially use GPRS in India. But how many people do really use it, and for what purposes?

The cellphone of today has processing power and memory comparable to what a PC had a decade ago. Undoubtedly, cellular network technology is going to provide access to the Internet for hundreds of millions of Indians before landlines do. With the division of work between a cellphone on one hand and computing and storage on the cloud on the other, the sky is the limit for what can be achieved. I do expect that India will see wide usage of cloud-based services soon. Private players as well as government departments will set up large cloud-based infrastructures in India. I would like to see the government focusing on such infrastructures for socially significant sectors such as education and healthcare, where a significant government role is necessary. Business and industry are best served by private service providers. Setting up cloud-based computing infrastructures is not rocket science today; what would make a difference is the identification and funding of relevant applications suited to Indian needs. Government funding has to be monitored carefully, as always, to ensure efficiency.

India is a country in which most benefits conferred by quality education, quality healthcare and technological developments such as IT, the Internet and aviation are enjoyed by 10 per cent of the population, which is also the 10 per cent that uses English. The use of Indian languages on PCs and over the Internet has been disappointingly low. Some colleagues are excited by the rapid growth of English usage. However, fast this might be, the majority of Indians will continue to use Indian languages as their preferred or only language. So, creation of content in Indian language should be promoted.

I believe that the Internet is only a sophisticated plumbing system; what really matters is what flows through the plumbing – information in very accessible and usable forms. Compare it with the plumbing we all carry in our bodies – a pump called the heart and the pipes called arteries and veins. They are important only because they deliver something valuable wherever it is needed – blood!

How many e-books in Indian languages have you seen? Let us have an annual competition to identify the best hundred e-books created that year in Indian languages and give one lakh rupees as prize money to the authors of each book. The money required is peanuts in comparison to what we spent on the Commonwealth Games in 2010. Let us create a body of knowledge in Indian languages on the web in the form of videos in Indian languages. I mean videos of educational and informational value – for instance four hundred video clips to cover four hundred significant diseases, in each of the fifteen Indian languages, for use by the common man. What would 6,000 video clips, each between 3 and 10 minutes in length cost, particularly when we have a large number of professors and students in medicine to record these videos? If India has hundreds of millions of cellphones, why do auto-rickshaws spend hours waiting for passengers? And why do passengers have to beg or bribe auto-rickshaw drivers to take them where they need to go? These suggestions are mere examples of what we can do and should do; we can identify a hundred such useful things to do if we decide that such things are worth doing. These may be humble suggestions, but they propose endeavours more important than putting an Indian on the moon!

Language is only one aspect that decides the usability of a device or a service for a given target group. Complexity is another. The complexity of the user interface on a PC or a laptop is absurdly high. If IT has to be useful beyond the 10 per cent of the population that has everything, we would need much simpler interfaces. This is true for cellphones as well.

Some models of smart phones may become available below Rs. 5,000. That would not change anything very much! They would need to have very well designed interfaces designed with the other 90 per cent of the population in mind. We also need to invent new ways of guiding the user to sources of relevant information. Can we tell the other 90 per cent that they had better learn quickly how to use a search engine like an expert if they wish to find anything useful? No way! We use units such as MHz for CPU speed and GB for information storage capacity; we need a unit named "Coverage" to indicate what percentage of a population can easily use a device or service. Most devices and services should have a coverage of 70 per cent or more.

I would like to end this chapter on a positive note, confident that India will cope well with these challenges. Let us be critical of ourselves, but for the sake of driving us forward, not for making us defeatist. I got a surprise today as I was writing the last few paragraphs. Meru taxis in Bangalore told me that they would charge me booking fees of Rs. 50 to book me a taxi over the phone, but there would be no booking fee if I did the booking over the Internet. So, the presence of Inter net in major cities is being taken for granted, and non-users have to pay a penalty.

References

[1] *He later served as Secretary to the Government in the Department of Electronics and as Minister of State for Science and Technology. His vision played a key role in the bold steps India took in the 1970s and 1980s in the field of electronics and in particular in the field of computer networking.*

[2] *I think this was in 1978 or 1979.*

[3] *A later development, Ethernet technology, is also based on a contention protocol.*

[4] *This was a part of the 3 to 7 GHz band in which the APPLE satellite operated. The modern day VSATs operate in the Ku band (11 to 18 GHz), for which you can comfortably use smaller antennas that you see on top of buildings in which stock brokers have their offices.*

[5] *See Wikipedia for more on Prestel.*

[6] *"A New Type of Communication Satellite needed for Computer Messaging", S. Ramani and R. Miller, Proc. of the International Conference on Computer Communication, London, 1982.*

[7] *I quote a part of David Balson's background note for the Proceedings of an International Workshop organized by the International Development Research Centre, Volunteers in Technical Assistance, and United Nations University, held in Nairobi, Kenya, 24-26 August 1992. You can get a copy of the Proceedings from the Web.*

[8] *http://idl-bnc.idrc.ca/dspace/bitstream/10625/14782/1/99186.pdf*

[9] *"Dr. Ramani (Tata Institute of Fundamental Research, India), who is a participant in this workshop, proposed the concept of a low-earth-orbit communications satellite to be built by developing countries for development communications at an ISSD-sponsored Workshop on Computer-based Conferencing in 1981. This workshop gave birth to ISSD's Telematics Program. This Program has promoted and supported the development, testing and evaluation of networking techniques and technologies in developing countries in support of development and research objectives. Since this 1981 workshop the Program has promoted this technology as a response to "last mile" communications problems.*

[10] *The concept was explored further by Dr. Ramani and others: Richard Miller and Dr. Ramani co-authored a paper on the concept for ICCC '82. Ramani with the Indian Space Research Organization and Space Applications Centre; and with Yash Pal, Secretary-General of UNISPACE '82, at that Conference where one of its recommendations urged further developments in this field.*

[11] *In late 1982, Volunteers in Technical Assistance and the Radio Amateur Satellite Corporation (AMSAT) picked up the concept and developed the Data Communications Experiment (DCE) payload as a prototype of their proposed low-earth-orbit electronic messaging satellite, PACSAT. The DCE was launched in 1984 on UOSAT-2 (a satellite built by the University of Surrey). An upgraded PACSAT Communications Ex-*

periment (PCE) was launched in 1990 on UOSAT-3. IDRC funded a demonstration of the DCE at the Pacific Telecommunications Conference in Honolulu in 1985".

[12] *Anurag Kumar, M N Faruqi, B N Jain, S L Mehndiratta, S V Raghavan, S Ramakrishnan, S Ramani, and K R Srivathsan. I apologise to colleagues at NCST and elsewhere whose contributions I have been unable to acknowledge here.*

Dr. Srinivasan Ramani earned his PhD at IIT Bombay. He has worked as a researcher at the Tata Institute of Fundamental Research (TIFR), Bombay, and at the Carnegie-Mellon University, Pittsburgh. He was the founding director of the National Centre for Software Technology (NCST), where he played a key role in creating India's academic network ERNET that brought the Internet to India. He was the first director of Hewlett Packard Labs India in 2001. He has served as a member of the Expert Panel of Advisors of the United Nation's Task Force on ICT for Development. He has also served as Chairman of the Computer Society of India and as Chairman of the International Council for Computer Communication. He moved on to the International Institute of Information Technology in 2007, where he now serves as a professor.

Chapter 4

T. H. Chowdary

Birth and Growth of Internet in India

Editor's Note

This chapter explains how Internet is the greatest technological invention that is enhancing the intellectual power and sweep of man. In India, some of the early challenges to Internet growth were monopolistic and restrictive practices of the Department of Telecom (DOT), and its conflict with state-owned Videsh Sanchar Nigam Limited (VSNL). The end to monopoly ushered in by the government in 1998 led to licensing of private ISPs, establishment of numerous Internet Cafés for public use, and later on, approval of VoIP services. However, the funds that were raised by private ISPs were largely going to the government as license fee payments and not into the buildup of the network, and it was necessary to level the playing field. Emerging challenges today include ensuring affordable and ubiquitous broadband, and Internet security.

This chapter draws on my memos, representations and articles that were a sort of running commentary on the DoT's policies from the 1990s onwards. The essence of those years' long educational and agitational writing was that telecoms have been transformed into an electronic and photonic transportation system for electronic information –voice, text, images, and data. Humanity, moving into an information and knowledge era from industrial era, is going to use the new technology and the myriad services it supports to evolve into a new civilisation.

I have been a campaigner for decades, even while in DoT's service, for an end of its monopoly, private sector entry, competition and independent statutory regulation. I succeeded finally due industry support as well as access to Prime Minister Rajiv Gandhi and P. V. Narasimha Rao, and subsequently to the leaders of the NDA government – L. K. Advani, Sushma Swaraj, and Pramod Mahajan. N Chandra Babu Naidu, the IT evangelist and Chief Minister of Andhra Pradesh in the late 1990s and early 2000s, for whose government I was an IT Adviser, persuaded and pushed the NDA government (1998-2004) to adopt the most liberal and forward-looking telecom and IT policies.

The Origin of the Internet

The greatest technological invention that is enhancing intellectual power of man is the Internet. Its origins are in the United States. Its birth was necessitated by the USA's concern for the survival of its telecom network in the event of a nuclear war between the former USSR and USA. Communications, command and control are essential during any war and these systems would be the prime targets for destruction by the enemy. In order to ensure continuance of communications, alternative infrastructure was envisaged and the work was entrusted to ARPA – Advanced Research Projects Agency, which was later designated as DARPA - Defence Advanced Research Projects Agency. The developments began in the 1970s and were continuously upgraded.

A giant leap in the technology and its utility came with the invention of the World Wide Web (WWW) by Tim Berners-Lee, a scientist working in CERN (Centre for European Nuclear Research) in Berne, Switzerland in 1991. Today, information in research papers, catalogs, articles, statistics, archives, company literature, views, news, and pamphlets are available in websites spread all over the world. Not only organisations, but every individual could create his/her own website and easily become a publisher, a campaigner or an activist.

International standards had to be evolved so that different networks of national states in the entire world could seamlessly communicate and exchange data with one another. The CCITT (International Telegraph and Telephone Consultative Committee) did not take the necessary initiatives in regard to the development of the Internet, services and data networks and packet switching. Internet Engineering Task Force (IETF) came as a voluntary body of academics, technologists and IT companies in many countries interested in promoting the Internet. A Protocol- TCP/IP was standardised for communications between computers and such devices. This is the universal machine language. Vinton Cerf, who was one the pioneers involved in the development of TCP/IP, was later acknowledged as one of the "fathers of the Internet". The ITEF and the CCITT come together over a period of time and by now the global Internet system is a wonderfully working network.

The global telecom network, which links all websites comprises of optical fibre cables, underground as well as on sea-beds linking all towns, cities, countries and continents; communication satellites in the Geostationary Orbit, 36,500 km above the equator, and terrestrial microwave radio systems are electronic highways that link the websites across the globe.

Communication devices, which connect to the global network of telecoms and websites include PCs, laptops, cell phones, iPhone, iPads, and ever so many such devices that are continuing to come up. These devices do not require wires to connect to the network. This is another giant step forward in the ability of humans to communicate with one another, at anytime, from anywhere to anywhere.

Eighth Wonder of the World

By now there are about a billion websites. Communication devices connecting to the Internet number over 3.5 billion for the world's population of 6.5 billion. Millions of books in libraries spread over the world are all now available on the websites. The most outstanding of these is the information available in the Library of Congress of the USA. It has 128 million items; 849 km of shelves; 29 million books and other printed materials (500 languages); 2.7 million recordings; 12 million photographs; 4.8 million maps; and 57 million manuscripts.

The Internet has now become a platform for every type of activity of the mind. It is a book store, post office, telephone, broadcast studio, soap box, auction house, sound recording, movie theatre, used-car showroom, insurance office, distributor warehouse, fashion studio, university class room, political campaign, medical diagnostics, and so on. No wonder it has been called the eighth wonder of the world.

Internet in India

The birth and growth of Internet in India is the outcome of struggles between those who look upon the Internet as a facilitator for development of human resource and those who want to have control over the Internet as a commercial service. One of the earliest steps for Internet in India was the commissioning of Gateway Packet Switching System (GPSS) by Videsh Sanchar Nigam Limited (VSNL) in August, 1989. This enabled the transmission of packets of information from India to any destination in the world. The VSNL supplied PADs (Packet Assembler - Dissembler) to those who wanted to gain access to data banks - stores of information in electronic form by several companies and organisations. The VSNL opened bureaus in its four gateway cities of Mumbai, Delhi, Chennai, and Calcutta for online data search services. Those who did not have leased lines from their offices to the gateways but wanted to search for information could come to these bureaus. Technical persons were deployed by the VSNL to assist those who could not search online themselves. Because of the GPSS, electronic mail or email was another service which was offered from the bureaus. Very significantly, the first bureau was inaugurated in Mumbai in September, 1989, not by any Minister or a government officer but by the then largest user of online search facilities, the Chairman of Procter and Gamble, Gurcharan Das. The extension of these services to other cities and towns was frowned upon by the DoT and therefore was restricted to the public bureaus in the buildings of VSNL in the four metro cities.

The Internet service was first introduced in India by the VSNL in 1995. It could do so only in the four gateway cities of Mumbai, Delhi, Chennai, and Calcutta, from where it operated as DoT did not allow it to offer elsewhere. Users had to either take leased lines or dial a particular number to connect to the Internet. Two years after its introduction, there were just 40,000 subscribers in 20 Indian cities in September 1997, compared to 500,000 in Singapore, Hong Kong, Malaysia, and Taiwan. In 1996, I was pleading for providing Internet connections in all schools, libraries, colleges, and universities. I argued that access to information this would provide would be of immense benefit to students and teachers alike. Therefore Internet service should be extended to many cities and should be affordable to many more people.

Voice over Internet Protocol (VoIP)

In 1995, Vocal Tec, an Israeli Company, developed the technology for sending voice over Internet. One had to dial a number, where a server would packetise the voice and send it over the Internet. The state-owned Finnish Telephone company offered Internet telephony as one of the choices. Recognising that this is a new product and if VoIP is extensively available, there would be no difference between a local, national, long distance and international calls, I pleaded that the DoT should permit VoIP and that C-DOT or any other organisation should be financed to develop this technology ourselves, so that we would not have to buy it later from somebody else. I was absolutely certain that even if the DoT went on opposing for some time, the service would be smuggled and then it would become inevitable for DoT to permit VoIP. It is permissible now, but the technology used is not indigenously developed and so we pay for it.

A policy issue and program taken up was that all STD booths (which by the late 1990s were over 300,000 in the country) should be upgraded into tele-cottages or Information Kiosks. In Andhra Pradesh, as a part of Vision 2020, IT and Telecom were envisaged as engines of development and the state government came forward to assist the STD booth operators to upgrade their booths into Internet kiosks. The investment required was Rs. 50,000 – the state government would give an outright grant of Rs. 10,000 and banks were led to give a loan of Rs. 30,000 to every booth operator, who would put in Rs. 10,000. As this scheme proved to be very attractive, politics took over. As this scheme proved to be very attractive, politics took over with different parties vying for selection of operators, and the programme unfortunately did not take off.

The birth and subsequent growth of Internet and broadband services in India has gone through a series of upheavals. Here are some of the major highlights of the evolution and growth of Internet in India:

- The end to monopoly, ushered in by the National Democratic Alliance (NDA) government in 1998
- Entry of private sector Internet (and value-added) service providers (ISPs)
- The restrictive exertions of the DoT as licensor and rule-maker make the roll-out and use of Internet as difficult and costly as possible
- A liberal and corporate-friendly Internet Policy, recommended by the Prime-Minister's National Task Force on Software and IT, and its immediate promulgation in 1998
- The licensing of more than 400 private ISPs (PISPs) within a year
- Establishment of numerous Internet cafés for public use
- Ban on VoIP by DoT for some time and its smuggled and eventual permission
- Very slow adoption of broadband Internet as the quality of wired telephone network and cable TV networks were not good enough for DSL equipment imposition
- The permit-license-quota mindset, auctioning spectrum for broadband services (realising about Rs. 30,000 crores to be squandered on populist, vote-buying "welfare" give-away)

De-monopolising the Internet Service

Why should Internet be a monopoly service? It was the Jalan Committee which suggested some of the liberalisation measures for telecom services. It was reported to have recommended the de-monopolisation of Internet, among others. But the report was not made public. The first liberalisation, that is, provision of non-telephony telecom service including email and Internet etc., were mooted in the Jalan Committee Report. These were de-monopolised. The email companies were losing. They thought that since Internet works on the email technology, they could provide Internet service also but the DoT insisted that they should have another license. They also wanted to provide eCommerce but the DoT said that the emails' X-25 network and the eCommerce TCP/IP network should be separate. The DoT was charging double the stated tariff for circuits that private telcos leased to provide the licenced value-added services like e-mail, e-commerce, and Internet. The Jalan Report was classified as secret. It was not given even to the TRAI.

The DoT as the policy maker, licensor and operator should have planned for an e-mail exchange in India. The private ISPs and e-mail licensees, rivals as they were, could not bring one into being. The Center for Telecom Management and Studies convened a meeting of Internet and e-mail service providers to nudge them to co-operatively install and operationalise such an exchange. It came up eventually only after the DOE and DoT were brought together under one Ministry; the DOE spearheaded the move.

The monopoly and restriction on the growth of Internet and its use continued, until the NDA government came to power in Delhi in 1998. The Prime Minister appointed the National Task Force on IT & Software (NTFITS) and very wisely invited N. Chandra Babu Naidu, the IT evangelising Chief Minister of Andhra Pradesh to be the Co-Chairman, although he was part of the opposition United Democratic Front. I was a Member of this Task Force. N. Seshagiri, the Director General of the National Informatics Centre (NIC) and I produced the draft reports with the full backing and advocacy by Chandra Babu Naidu. The most important recommendation, which was adopted within one month of the presentation of this report, was related to the Internet. We made it a most liberal, facilitative and promotional policy. The highlights of the Internet Policy adopted for implementation by the NDA government were:

- The monopoly of government for provision of Internet and related services was abolished
- There was to be no license fee or any revenue share; a token fee of Re. 1 was prescribed for the private internt service providers (PISPs)
- Private companies could take a license for a city, a group of cities, a state, for number of states or the whole of India
- They could pick up Internet subscribers by whatever means they like - wireless or wired and for this purpose they can establish their own wireless networks in the access segment
- They could connect to the international Internet backbones by whatever means they, in cluding setting up very small aperture terminals (V-SATs) utilising either the INSAT or INTELSAT or any other satellite communications systems
- They could open public Internet kiosks and provide email facility to anyone

This extraordinary, company-friendly and promotional policy was adopted over the opposition of the monopoly-hugging DoT officers. They were, however, required to appear before the Task Force during its deliberations. They used to oppose every liberalising measure. Sushma Swaraj was then the Minister for Communications. We used to seek her intervention, pointing out that in the manifesto of the BJP what we are envisaging for the Internet has been included. She used to overrule the objections of the DoT officers. With the promulgation of this policy, there was an upsurge of PISPs. Over 400 licenses were given. The first company to go into extensive service all over the country and open hundreds of public Internet kiosks (Trade mark I-Ways) is what is now known as SIFY. It began its operations in 1998.

Mobile phones in the years to come will connect to Internet.

Rate of Growth of Internet Users Till 2013 (%YOY)	
India	15%
China	11%
US	10.5%
UK	8%
Brazil	7%

No. of mobile phones/ 100 persons			
	2007	2008	2009
Developed countries	50	97	115
Developing countries	5	45	57*

* India in 2010 - 65 (Source: Economic Times, 21/9/2010)

The liberality of the Indian Internet policy has no parallel in the world. Just at this time, the private telecom companies were about to die because these companies had bid fantastic amounts to get the licenses. They were to pay the license fees upfront; that is, whether they had the network or not, whether they had connections or not, whether they earned revenues or not, they had to pay the annual license fees at the beginning of the year itself. The funds that were raised by them were mostly going into the license fee payment and not in building up the network. Then, they approached the government, contrasting their license conditions with those for the Internet. As a consequence, after obtaining a report from a group of wise people, the NDA government promulgated the new Telecom Policy (NTP-'99) in the year 1999, which grand-parented the NTP-'94 licensee private telecom companies. They all migrated from the license fee payment conditions to revenue sharing.

At the same time, the regulatory system was also reorganised so that it became really liberal and facilitative of the emergence of competition and level playing field. The DoT, which was not allowed to offer the new services like cell phones and Internet and e-mail, etc., was allowed to offer all services in competition with the private telecom companies. In order to level up the competition, the telecom services of the DoT were constituted into the state-owned corporation Bharat Sanchar Nigam Ltd. (BSNL) on October 10, 2000.

BSNL entered the fray to provide among others, Internet service. It had great advantage because it had the wired network, which had by the year 2000, reached over 27 million subscribers growing at the rate of 4 million per year. Not only could it give dialup access but also DSL broadband. The Internet policy also allowed cable TV companies to offer Internet service over the cable that had already reached several millions homes. As the incumbent and also as the government-owned company, the BSNL tried to make the Internet service offered by the PISPs as costly as possible. If the Internet was accessed by dial-up connection to the point of presence (POP) of the PISP, it was treated as an STD call but if the dial-up was from a BSNL subscriber, it was charged as a local call. The PISP subscriber had to pay very heavily.

The NDA government levelled it up by ruling that the PISPs subscribers will be paying the same amount to reach their POP as the BSNL's subscribers. The BSNL again struck by timing the local access. For an hour's Internet service, while the PISPs were charging about Rs. 20, that hour of dialup access over the BSNL network was being charged Rs. 21. On appeal, the NDA government levelled down this as well.

For getting all the adverse impositions removed and making the Internet policy really people- oriented, our argument was that Internet is the greatest aid for human development, and for acquisition and dissemination of knowledge.

Government's resolve to push Broadband

Over time, the UPA government also became IT-friendly. Its greatest contribution for the promotion of Internet is its ruling that BSNL should provide broadband connections at almost a throw-away price. No private company has got that advantage because of the existing extensive wired network that the BSNL has and its presence in the rural areas much more extensively than the private telephone companies. The 3G and broadband services are greatly facilitative of the use of Internet at very high speeds, from 10 to 100 mbps.

Growth of Internet

Although more than 400 licenses were given for Internet service, now no more than about 40 PISPs are active. Latest cell phones have built-in access to the Internet. It is no longer necessary to have any computer to access the Internet. Mobile Internet use is already on the increase. Mobile banking through cell phones is becoming popular. The growth of ATMs and Internet banking will be pushing the Internet use. Profile of India's Internet users is given in tables below.

India's Internet Subscribers Technology wise

Type	As on Mar '10
DSL	48.98%
Cable Modem	4.39%
Leased Line	0.19%
Ethernet LAN	3.74%
Fibre	0.22%
Radio	6.88%
Dialup	35.32%
Others	0.27%

Market Share of 5 major ISPs as on Mar '10

ISP	Market Share (as on mar '10)
BSNL	56.76
MTNL	14.29
Bharti Airtel Ltd.	8.07
Reliance Commn. Infra. Ltd.	7.56
Hathway Cable & Datacom Pvt. Ltd.	1.94

Internet Telephony Minutes

Year	Millions
Jan-Mar' 08	115.04
Apr-June' 08	111.68
July-Sep' 08	132.66
Oct-Dec' 08	133.23
Mar' 09	131.63
Jun' 09	131.94
Sept' 09	118.01
Dec '09	120.48
Mar '10	122.96

A policy issue and program taken up was that all STD booths, which by the late 1990s were over 300,000 in the country, should be upgraded in to Tele-cottages or Information Kiosks. Each maybe equipped with a PC and a scanner and FAX. E-mail could be given from these booths. Any person writing in any language could bring the matter to be sent on the Internet rather than through the post office. The matter would be scanned and sent away to an STD booth in the objective city. It will be converted into letter form and delivered to the addressee by the booth operator. This would be an alternative to postal service. It would be cheaper and quicker. The post office itself could spearhead this alternative method of delivery of letters. In Andhra Pradesh, as part of Vision 2020, IT and Telecom were envisaged as engines of development and the state government came forward to assist the STD booth operators to upgrade their booths into Internet kiosks. The investment required was Rs. 50,000 Government of Andhra Pradesh would give an outright grant of Rs. 10,000; banks were led to give a loan of Rs. 30,000 to every booth operator. He would put Rs. 10,000. As this scheme proved to be very attractive, politics took over. It was said that STD operators were chosen by the Congress government. Why should they be benefited? Instead, the Telugu Desam government, too, can select another set of persons for these information kiosks or tele-cottages. It was taken up as a government scheme for employment of youth. As any government -involved scheme flounders when politics enter, it did not take off.

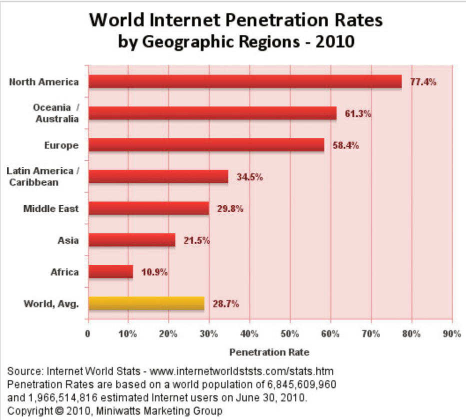
The Internet, as introduced in India, in the initial stages was very costly. While the ISPs were charging Rs. 20 per hour for Internet usage, the dial up access was being charged one unit of Rs. 1 per 3 min. It was costing Rs. 21. So access to Internet was costlier than the use of Internet. DoT also imposed a surcharge of 25% over normal charges if a leased line was used for Internet access. Another restriction of the BSNL as Government Company and the DoT was that the private ISPs should connect to the international backbone only through the VSNL's gateways. The VSNL was itself an operator holding this bottleneck facility. So it was unfair competition.

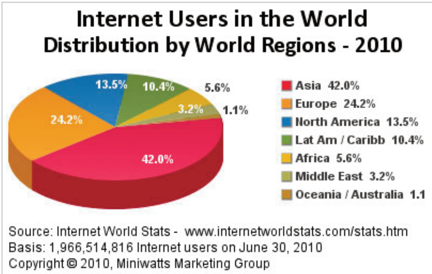
Internet Subscribers Including Broadband

Year	Subscribers (in lakhs)	Growth (%)
Mar-03	36	
Mar-04	45	25
Mar-05	56.5	26
Mar-06	69.4	23
Mar-07	92.71	34
Mar-08	110.09	20
Mar-09	135.4	22
Jun-09	140.5	4
Sept-09	146.3	4
Dec-09	152.4	4.21
Mar-10	161.8	6.17

Growth of Broadband Subscribers: 256 kbps and more

Year	Subscribers (in lakhs)	Growth (%)
Mar-03	0.08	
Mar-04	0.19	138
Mar-05	1.8	847
Mar-06	13.5	650
Mar-07	23.39	73
Mar-08	38.7	65
Mar-09	62.17	61
Jun-09	66.2	6
Sept-09	72.1	9
Dec-09	78.2	8.50
Mar-10	87.7	12.20





Internet Penetration (users for 100 people) in Select Asian Countries

India	China	Pakistan	Philippines	Sri Lanka	Taiwan	Vietnam
6.9	31.6	10.4	29.7	8.3	70.1	27.1

Note: China, Philippines & Vietnam are emerging as India's competitors for outsourced services. All have higher penetration of Internet, significant indicator of IT talent availability.

Internet Penetration (users for 100 people) in Select Asian Countries

India	2000	2009*	2020
No. of Internet users	5.0 crore	8.1 crore	39 crore
No. of ATMs	<3,000	44,000	1.25 lakh
No. of Internet banking users	<500,000	2.2 crore	18.5 crore

* China has 180,000 ATMs (Source: Economic Times, 21/9/2010)

The Dark Side: Evil on the Internet

While for the well intentioned users and enterprises, Internet is a source of knowledge and wealth creation, it is also being utilised by a variety of criminals for their activities. Spam, denial of service, identity theft, hacking for erasure and falsification, espionage by exfiltration (China, USA, and Russia have state patronised groups for this activity), illegal money transfers, terrorist attacks, love-jihad, pornography are daily experiences in India. The security and defences of the country, the privacy and sanctity of home are all coming under increasing threat. Security on the Net must receive utmost attention. International laws and agreements have to be put in place. Terrorists, purveyors of pornography, fraudsters stealing money from bank accounts, espionage agents, exfiltration of non-state players from "enemy" states' security and defence forces, drug-peddlers, dealers in flesh trade and such scum are using the Internet for their nefarious activities.

New malicious code signatures (millions)	
2004	0.04
2005	0.09
2006	0.18
2007	0.71
2008	1.69
2009	2.90

% of attacks by originating country	
Russia	13.0%
US	12.0%
China	7.5%
Brazil	6.4%
Taiwan	5.5%
Italy	4.5%
Germany	4.4%
India	3.3%
Argentina	3.1%
Romania	3.0%
Other	37.3%

Not all countries have appropriate and adequate laws relating to use of information technology; crimes happen over international networks. In the absence of international regulations and treaties relating to use of Internet, crimes are multiplying. Hacking, phishing, spam, identity theft, worms, malware, viruses, etc., are growing in frequency and damage. Countries like China are militarising cyberspace and weaponising software to train to wage information warfare. The criminal activity in cyberspace can be gauged from the following:

- Number of BOTs : Infected computers Minimum- 792,000; Maximum – 1,880,000
- Average share of all spam: 23.9%
- Average spam output globally: 31.6 bn/ day; 21.9 mn/ minute
- Spam produced pe BOT:210,859/ day; 146.4/min; 2.4/sec

(Source: Message Labs Intelligence Report, April 2010 in Technology Review, July/Aug 2010)

% of organisations affected	
Malware infection	64%
Fraudulence represented as Phishing	34%
Denial of service	29%
Bots of zombies within organization	23%
Password sniffing	17%
Exploit of wireless network	8%
Exploit of domain name server	7%

(Source: Technology Review, Vol.113, No: 4, 21-23 Sept 2010)

Internet and information security have not been receiving adequate attention in our country. We cannot keep buying security products and retrofit them into our IT equipments. India must develop these products indigenously. Government and IT companies must work together to undertake R&D. They must participate in international IT events to not merely update but future-date our knowledge and security systems. Code is becoming increasingly complex. That gives opportunity to ingenious crooks to find the vulnerabilities and exploit them to create BOTs (enslaved machines). If crimes and frauds increase, people would dread to use and benefit from the Internet.

Many countries have been setting up Computer Emergency Response Teams (CERTs) to advise the users about the attacks on their computer systems. The most comprehensive one, US-CERT is operated by the US Department of Homeland Security. In the European Union, there are over 100 CERTs. These are created locally by the universities and the large IT companies. The teams are cooperating via the PAN-European TF-CSIRT (Task Force Collaboration Security Incident Response Teams). In our country, the CERT has been operational for some time. India is a victim of hacking. The Indian CERT is operated by the Department of IT in Delhi. The extent of attacks on India can be gained from the following statistics of defacement Indian websites.

Defacement Statistics from 01 Jan 2010 to 31 July 2010	
Domains	No of Defacements
.com	1988
.org	229
.net	133
.in	3216
Others	25

(Source: www.cert-in.org.in)

Internet Addiction

Indian youth are gravitating towards addiction. The ASSOCHAM's Social Development Foundation, Delhi conducted a survey across 10 major Indian cities with a sample size of 1500 regular Internet users. Their findings are:

The daily usage is increasing as the age goes up. This trend is emerging mostly in Metros where normally both parents are employed. Online activities include doing home work, playing games, checking emails and chatting.

Internet use by Age Groups		
8-11 years old	**12-15 years old**	**16-18 years old**
52% surf over 5 hours	58% surf over 5 hours	56% surf over 5 hours
30% surf 1-5 hours daily	32% surf 1-5 hours daily	40% surf 1-5 hours daily
30% do not surf daily	32% do not surf daily	40% do not surf daily

(Source: www.cert-in.org.in)

Socialnetworking is on the rise. Lack of supervision at home is an important factor for increasing Internet use by the students.

The diffusion of Internet service to youth and students, some of them unemployed have been leading to Internet addiction (like cell phone and TV addiction). In China, which has the largest number of Internet users in the world, tens of thousands of young boys and girls have become addicts. Scores of "Internet Clinics" have been established where the addicts are treated to wean them away from the disease. The Chinese experience should serve as a warning to Indian parents.

The Future: Hope and Aspirations

For the first time in the history of mankind, information and knowledge are getting democratised in the sense that they can be available as and when they are created, to any person, anywhere in the world and at anytime. Information and knowledge are power. Internet is facilitating the acquisition of such power by every human being provided he/she is educated and willing to learn.

The ancient Indian aspiration that we shall all strive together to protect one another, to share the joys, to collaborate and not to hate, and that our learning should be brilliant can be realised by exploiting the full potential of Internet. Good and evil have always been there together in the world. So is evil also prevalent on the Internet. We should all hope for the good to prevail and strive to do so. Only then can the Internet be 'eighth wonder of the world'.

Dr. T. H. Chowdary is Director of the Centre for Telecom Management and Studies in Hyderabad. He was the first and founding Chairman and MD of VSNL, India's International Telecommunications Corporation. He wrote the draft National Telecom Policy (NTP) in 1989 & drafted the Telecom Regulatory Authority of India (TRAI) Bill, the basis for the final TRAI Act. He was a governor of INTELSAT, Washington, and INMARSAT, London. He has consulted for UNDP and ITU, and governments such as South Africa. He was Chairman of the Andhra Pradesh Electronics Development Corporation and the state's IT advisor, and member of the Prime Minister's National Task Force for Information Technology (NTFIT). He is a Senior Member of the IEEE (New York).

Amitabh Singhal

India's Internet Policy and Regulatory Regime

The Pioneering Role of Industry Associations

Editor's Note

This chapter recounts how the Indian Internet industry emerged over the past 15 years with the aim to remove obstacles and barriers and help fast forward the growth of the Internet economy. The Policy Building Process (PDP) by the industry goes back to the early years of VSAT, VAS and email messaging services in the early 90s. The Email and Internet Service Providers Association of India (EISPAI) was set up in 1994-95. It built pressure on DoT to mitigate high costs, irrational charges, and restrictions on international connectivity and local interconnectivity for private service providers. The TRAI Act of 1997 resulted in the establishment of an independent telecom regulator. ISP Policy of 1998 finally opened the door to private ISPs. EISPAI made its formal transition to becoming ISPAI, which was formally incorporated in 1998. The National Internet Exchange of India (NIXI) became operational in 2003. Telecom liberalisation in India has been slow, but it has been inexorable. Irregularities to be addressed include that fact that 90+ per cent of Internet traffic is in the hands of 7 or 8 operators; it should get dissipated amongst a larger number of players.

Discussions triggered off during the Digital Empowerment Foundation's Manthan Awards in December 2010 have led me to navigate back through the mists of time, through the bureaucratic maze, and recount how the Indian Internet industry worked together over the past 15 years with the sole aim of removing obstacles and barriers and help fast forward the building of the nascent online environment. Today, the Internet has become the platform to stretch a larger ICT canvas, and for wide sections of economy and society – but to sustain this momentum, the Internet in India must have strong foundations, in terms of sufficiency of resources, infrastructure capacities, cost efficiencies, availability, and ubiquity of access.

There was a fascinating journey for us, and many pioneers continue to do so tirelessly even after a couple of decades. We experienced the highs and the lows, but eventually we look back and can see clearly that there were more peaks and the troughs were few. We also look back and sometimes wonder if we could have done something better or handled an issue, a process, differently -- and if then we could have seen better or speedier results.

This chapter provides a capsule description of a decade long Policy Building Process (PDP) - though a larger more comprehensive treatment will do full justice to the range of events and contributions from many institutions and individuals that may not find space and mention for inclusion here, but whose importance and effect should not be underestimated. No successful PDP can be possible and concluded without a multi-dimensional and multi-pronged approach from multiple stakeholders.

Telecom Liberalisation Backdrop (1992-1997)

In India, the Telecom Commission was set up in 1989 and around the same time VSNL (now known as Tata Communications) was established to run the international communications services exclusively. MTNL was to operate in the Delhi and Mumbai telephone circles. Department of Telecommunications (DoT) was to run the telephone services in the rest of the country.

Consequent to the Indian economic reform process initiated in 1992 (following the foreign exchange crisis), the Government of India decided to deregulate the telecommunications sector and encourage private sector investment. That year saw the introduction of the Value Added Services (VAS) Licenses. At that time, VAS covered services like cellular mobile telephony (CMTS) and electronic mail (email). The Email Licenses permitted a subset of services, including E-mail, Electronic Data Interchange (EDI), Enhanced Fax and File Transfer Protocol (FTP).

Between the years 1992 and1994, about 11 Email licenses were taken, despite horror stories about the first pioneering E-mail Service provider company getting into a legal dispute with the DoT (which was then the Policy maker, Service Provider and a Regulator as well!) and losing a chunk of money not to mention the loss of reputation. This period really was the beginning of our own understanding of the yet uncharted territory of Policy and Regulatory management.

For starters, the email license holders had to pay license fees to the tune INR 5 million for the first year and INR 2.5 million for the subsequent years. The licenses were valid for five years. However the license fee was only the beginning of their troubles.

Secondly, the technology used for the networks was limited to X.25 protocol and international services were to be routed through VSNL's GEM 400 Gateway -- and VSNL itself was a provider of Email/eFax services as well.

Operators' networks were decreed against interconnecting with each other (if my memory serves me right), as a matter of course to prevent bypass of DoT/MTNL networks and hence avoiding impact to their monopolistic services and revenues. VSATs were used under another license category by another set of operators who could use VSATs only for Closed User Group (CUG) networks.

I also recollect that around the same time, Bulletin Board Services (BBS) were coming into vogue but these services were eventually hampered by the government policies imposing heavy fees on the providers and restricting their use, all because of the fear of their own services being undermined.

Third, the Email Licenses categorically set a tariff ceiling for the services offered, while the government monopolies controlled the backend infrastructure in terms of availability, restrictions on use and costs thereof.

Fourth, there were other charges such as port charges and interconnection charges that were fixed and levied by the monopolies on the telephone links and leased links that the operators had to pay, if they managed to obtain the resources in the first place. From application to approval to implementation, it used to take an average of 8-9 months to secure a 64 kbps leased line. A lot many applications never used to get approved on grounds of technical non-feasibility (TNF).

Email operators, therefore, incurred enormous costs because of these restrictions and mostly made the operations unviable, despite which a motley group of Email service providers continued to offer a fairly tolerable service to a growing size of clientele, both corporate and individuals.

I was part of one of these service providers, namely Global Electronic Commerce Services Ltd. (GECS). While helping to build an email network for GECS, I had first-hand experiences of dealing with the monopolies and their highhandedness, barring some exceptional officials, of course, who were helpful and who made those experiences somewhat tolerable.

It was within this backdrop that the foundation became one of the most effective telecom service industry associations in India. An invitation by one V.K. Gupta of Sprint RPG (I still call fondly call him our association's founding father), resulted in a meeting, sometime in November 1994, of some of the competing E-mail operators and I was part of the meeting representing Global, and others, including Datapro InfoTech, Crompton Greaves, Satyam Infoway (later to become Sify), Wipro, GE (not as an operator) and later on joined by Hughes Escorts.

For sometime then, Sprint RPG and others had been making individual attempts to draw the attention of the DoT to look into and address some of the problems being faced. These problems were almost mostly related to the difficulties faced by the operators in obtaining whatever meagre resources (as compared to standards today) were required to get their services going.

An outcome of this group meeting was the decision to set up a collective body, which would carry some weight and whose voice would more likely be heard. India's Email and Internet Service Providers Association (EISPAI) was then set up in 1994-95 and as the adopted name suggests, our collective aim had, right from the beginning, envisioned a transition from being merely Email service providers to Internet services (by then nascent but a growing phenomena globally) in India.

EISPAI was amongst the earliest telecom services industry associations to get active and helped create precedences that shaped the Indian telecom sector's policy development and regulatory interventions landscape in many ways: from influencing the way service license conditions were incorporated to reflect industry/consumer aspirations, cost based transparent tariff regulations in network resources, bandwidth availability and pricing, service and performance quality, technology neutrality, industry capacity building, new services opportunities, and so on.

It may not be out of place to say this: while other industry associations reacted to licenses announced by the government, EISPAI got proactive in getting the license conditions shaped before they were announced. In a an early briefing sessions to my own boss at Global Tele-systems, Manoj Tirodkar made an inspiring remark: “If you have decided to fight the system, don’t fight for money, fight for the future of the industry and the money will come.” This chapter explains how we precisely did that.

In early 1995, a formal EISPAI delegation met with the then Telecom Secretary N. Vittal. Apart from issues of resources, costs, charges, levies and such usual thorns, we brought up the idea of Email operators being allowed to connect to the Internet and thereby connect Indians to Internet. To my limited knowledge this was probably the first instance of an industry body approaching the Government of India to be allowed to introduce Internet services in India. The minutes of that meeting, however, summed up the mood of the government. It went something like this: “Internet is still nascent and allowing it will have serious security implications and hence needs a deeper consideration by the government. In the circumstances, the request cannot be acceded to immediately.”

An opportunity, therefore to open up Internet in 1995, itself to competition was denied and VSNL, the government monopoly, then quickly moved to launch Internet (the shell account type of service) on August 15, 1995, as the sole ISP in India. Most of the readers from those times will most likely remember the tribulations of trying to connect to the Internet, through hours of dialling, especially after 8.00pm when the telephones were expected to have less congestion and thus make it easier to connect to the VSNL Internet system.

Simultaneously, however, as EISPAI, we kept building up the pressure on DoT by bringing the issues of high costs, and review of onerous and irrational charges for network resources, -- but till about 1997, the traffic was pretty much one sided. There were complaints galore without as much as an iota of any mechanism to redress the issues.

The year 1997, however, was a highpoint in kick-starting the regulatory reforms process. March ’97 saw the assent of the President of India to the TRAI Act of 1997, resulting in the establishment of an independent telecom regulator, effectively ending DoT’s monopoly over regulating the sector and restricting its role to policy making. An effective delineation of Policy and Regulatory territories was thus marked out. It must be remembered that TRAI at that time started life as a quasi-judicial body and received petitions, heard arguments and counter arguments, and pronounced judgements and orders. It had teeth then, and lots of it -- and EISPAI made good use of it.

Petition No 1 of 1998 was filed by EISPAI members with TRAI. The cause of this petition was that DoT/MTNL arbitrarily decided to levy double the charges for the 64kbps leased links (yes that was the maximum capacity and speed of our data links then!). INR 1.4 million charges were hiked to INR 2.8 million by DoT/MTNL. The prayer was to disallow the double charges and refund excess payments made.

Most may not know this, but this was one of the first cases that came up in front of a then newly established regulator in 1998, but saw its ultimate conclusion, 10 years later, at the Supreme court in May 2008. It effectively upheld the contention and TDSAT order of 2003, that the double charges were indeed arbitrary and refunds were ordered.

While most players involved with the aforesaid petition were long gone, companies having either ceased operations, wound up or their personnel and my erstwhile colleagues moved on, I somehow managed to keep the faith, over a decade and support our gritty counsel, Meenakhshi Arora. We took the matter to a brilliant conclusion and established a case precedent on how not to set up a tariff policy, especially, if you are a monopoly or a significant market player (SMP).

Meanwhile, another important petition, which probably had a great bearing on the process of dismantling India’s monopoly international communications was filed with TRAI in 1998, which challenged the Service Quality of VSNLs GEMS 400 Gateway and prayed for allowing Email operators to have direct international leased line access. This petition, along with another huge development at the time, was to draw the attention of governments and others towards the case for allowing private sector's service providers to establish direct international leased links for more reliable and dependable email communication and the still awaited Internet services -- in effect asking for opening up international gateways to competition.

A committee set up under Bimal Jalan came out with a recommendation to allow private data networks like the Email providers to be allowed to direct international connectivity, albeit through VSNL. This was a crucial opening, which eventually also found its way into the 108 Resolution points of the Prime Ministers Task Force on Software and IT, in July 1998, which contained many landmark gazetted resolutions on key conditions for ISP services.

The ISP Policy and thereafter (1998 – 2005)

Most people may recall that an ISP policy allowing private sector participation was announced on November 6, 1998. But the real story is that the first ISP Policy announcement by the Government was actually made on January 15, 1998. A.V. Gokak was the Chairman, Telecom Commission then, and he himself was pitted against a powerful ITS lobby, sour at the thought of losing control to the private sector. The announcement in January lacked a couple of salient and vital features: it had no national level license, all you could get was a circle or a SSA license, and it made the licensees mandatorily seek international connectivity from VSNL gateways. As EISPAI, we moved fast and filed a petition seeking a stay on January 16, 1998 and TRAI stayed the policy on February 17, 1998, essentially saying that the policy did not meet certain equity norms and that it did not provide fair play to the new operators, against government monopolies.

After that, I remember personally spending a few months explaining to a livid media EISPAI's motivation to prevent Internet from being privatised. They all thought we meddled with a genuine privatisation process of Internet services, which clearly was not the case. I also did something everyone thought strange during this time – I sat in my office and drafted a sample copy of an ISP license, with the kind of clauses and conditions we wanted, and promptly sent it to key officials in DoT and to the TRAI, with the hope of extending assistance to all concerned about what an ideal ISP policy should look like.

Later on a senior Member of Telecom Commission, who later became a Member of TRAI, R.R.N. Prasad, commented on how he appreciated our effort, but could not possibly agree to the suggested conditions, since the government had its own limitations. He was to later play a key role in getting the Government to open up Internet telephony (even if limited) and ushering in VoIP (Voice Over Internet Protocol) as technology of choice for transmission networks.

In May 1998, The Prime Minister's Task Force on Information Technology and Software Development was set up with Dr. N. Seshagiri, the feisty DG of the government owned National Informatics Centre (NIC), as its convenor. One of the memorable meetings of this committee – as told to me by some who attended it then – led to an impasse on the ISP policy itself, between Dr. Seshagiri, TRAI and the DoT. DoT asserted its policy and licensing authority over matters concerning the Internet, while Dr. Seshagiri put his foot down saying essentially that the Internet belonged to no one and DoT had no birthright entitlement to govern it in India. TRAI said the matter was under its jurisdiction and only TRAI would decide what policy framework should be applied to Internet.

This impasse continued, but in the meanwhile, the Task Force itself completed its work and submitted its landmark report with 108 recommendations, which was approved by the Cabinet and gazetted by the Planning Commission in July, 1998. The report contained many of the guidelines that we had been seeking all along, including allowing ISPs to set up international gateways, reduction of double rental charges for leased line data circuits, and allowing ISPs to set up 'last mile' freely either by OFC or by Radio. This report for the first time asked for freeing up 2.400-2.4835 GHz band for the last mile connectivity. It was this report that also made it possible to finally de-license of Fax services in India!

Sometime in October, 1998, I received a call from Dr. Seshagiri, who wanted me to get over to his office and have a look at the draft ISP license that DoT had prepared. He had two points to make: (1) that DoT had incorporated all the terms that the industry was fighting for and were included in the Task Force Report, but (2) he was totally against the idea of DoT/Government licensing ISP services.

Between January-February 1998, when we got the stay on the original ISP policy, I had learnt a few more lessons and so my response to Dr. Seshagiri was:

(i) That we may call the ISP service guidelines, by whatever name, it would not matter. It could be a Memorandum, Agreement and or License, but we still needed some document that would be formally signed off by the potential ISP with somebody, so that any customer has some strings to hold on to, if a service provider defaulted on commitments. Otherwise, there would be no safeguard for the customer's rights or money. (I gave him the example of NBFCs (non-banking financial companies) who had recently lost huge monies of public investors on bogus schemes - and then equated it to the hype that was being built up for Internet around that time.) Much to my relief and to his credit, Dr. Seshagiri agreed and finally let DoT have its way on Licensing ISP services.

(ii) To point out that DoT had twisted the language in the drafted conditions in a manner which, if their grammatical version was accepted, would eventually be interpreted so as to lead back to retaining the monopoly of VSNL over international links and making the ISPs no more than glorified franchisees of the government monopoly. So in a sense DoT's claim to the Task Force of having incorporated liberal conditions was really quite bogus.

That made him livid and it led me to spend the evening and the whole of the next day in his office, drafting another version of an ISP License document. This draft went into the file, which travelled all the way to the Prime Minister, who gave his assent to the final ISP License conditions, that was finally announced on November 6, 1998.

Meanwhile, while all the action was in progress, EISPAI made its formal transition to becoming ISPAI, which was formally incorporated on November 2, 1998.

One of the first official industry actions that ISPAI became part of, soon after, was the success of its effort to obtain a open skies policy for ISPs, by which ISPs were allowed to buy and use bandwidth for their satellite gateways from any India co-ordinated satellite system, unlike the prevalent policy of being forced to depend upon the INSAT system via the Department of Space. As ISPAI, we lobbied hard and as part of the Industry Group on Telecom (In-GoT) forced an end to the satellite monopoly and that was a great beginning for ISPAI, in helping to create path-breaking regulations.

An important event that I distinctly remember was the frustration at not seeing any progress on getting direct international leased links, despite all efforts and committee reports. Our efforts to get direct access to FLAG cable system (the only one available at the time) was successfully stymied by VSNL time and again. Media pressure made them relent somewhat but only to the extent of being able to obtain international links at unreasonably high costs. So, one day, we sat and wrote a couple of notes to the then Hon'ble Prime Minister, suggesting that the IT Task Force recommendations be best implemented by allowing ISPs to set up Submarine Cable-based Gateways.

Within the next couple of weeks, following a surprise announcement by the then Prime Minister at the FICCI Annual Meeting, the PMO issued a notification on December 13,.1999, setting up the Group on Telecom and IT Convergence. One of the Terms of Reference was to resolve problems in ISP Policy implementation especially through the liberalisation of Gateways Policy. I was invited to be one of the nine members of the Expert Panel for the Group, which included many well known stalwarts of the industry including K.V. Kamath, Rajan Mittal, R.V. Seshasayee and R.R. Shah.

My colleague, Deepak Maheshwari and I prepared a presentation for the Group. The ensuing proceedings in a meeting on February 7, 2000, in the presence of Montek Ahluwalia, N.K. Singh, Secretaries of DoT, DIT led to the Government accepting our recommendation to allow private investment in building Submarine gateways, and advancing the ending of VSNL's monopoly guaranteed monopoly status from 2004 to 2002.

I think this was one single meeting that was truly epochal, resulting in a decision, which eventually led to India transitioning from a poorly connected, (internationally) bandwidth hungry country to a country whose telecom companies like Bharti, Reliance, Tata and others eventually came to collectively own a big chunk of global networks. Unfortunately, after 10 years of this event, our domestic bandwidth capacity, especially in the last mile, is pretty restricted in many ways.

Incidentally, this Group also was mandated to recommend measures to strengthen TRAI through legislative amendments. The result was the TRAI Act amendment of 2000 and setting up of TDSAT, thereby effectively turning TRAI into a recommendatory body (and also to become considered as quite toothless by many) and TDSAT assuming the quasi-judicial role.

Another important outcome of this Groups proceeding was our sustained effort to get in place a recommendation to open up Internet Telephony. We had to wait, but it happened (albeit in a restricted manner), exactly two years later, to coincide with the end of VSNL's international monopoly.

TRAI initiated a consultation process on November 13, 2001 and gave its recommendation on February 20, 2002, asking for opening up of Internet Telephony. I remember the flutter it created the day TRAI announced its intention to allow Internet Telephony, recognising it as an application service and secondly, allowing VoIP as a technology option for facility based operators like BSOs, CMSPs and NLDOs. ISPAI received little recognition from the rest of the industry for its work, which paved the way for allowing IP as a carrier technology, but did get its fair share of flak for trying to disrupt the business model of telecom companies by insisting on opening Internet Telephony. DoT, at the time, tried a bit to scuttle the TRAI recommendation, but we at ISPAI ensured, with a generous doze of media and public support, that IP telephony finally made its entry in April 2002.

My reminiscences on the subject would be incomplete if I did not mention here that from 1997 onwards itself, first as EISPAI and later as ISPAI, we put in enormous effort time and again working with the TRAI on improving the bandwidth situation in the country. From fighting over the unjust levy of INR 15,000/- per access line and getting it removed, to rationalisation of tariffs and provisioning of E1/R2 links, we fought every inch of the way, to ensure that TRAI reviewed domestic and international bandwidth tariffs periodically and every time it was reviewed (and we continued to maintain that TRAI could do more), the prices were brought down substantially. Without this body of work, over a decade's time, Internet access at the current price levels could possibly have not been even thinkable.

At ISPAI, we used all possible resources and intelligence to make a case for TRAI to bring in a semblance of cost based pricing structure for bandwidth and I think that even after 13 years (since 1997 when TRAI initiated the tariff re-structuring process), bandwidth issues will remain a case of work in progress, almost infinitely.

Current industry groups and associations must constantly work on it and this is the essential piece that makes the regulatory wheels moving; we have copious documents chronicling each of these steps.

Pricing did not remain our only target. We also built the case for timely provisioning and worked with TRAI to usher in monitoring the quality of services (starting with QoS for ISP services in 2001) as well.

NIXI – National Internet Exchange of India

From late 1998 to 2000, over 450 ISP licenses were taken, but the nascent ISP industry was still in the throes of its struggle with the difficult resource situation. Private telecom operators had hardly been able to put in any network that could afford competition to DTS – the service provider arm of DoT that became Department of Telecom Services and finally became BSNL.

ISPAI members had been concerned with the bandwidth capacity and cost issues, and solutions eluded us at that stage. We continued to look for alternatives to improve our capacities, and meet the growing market needs and increasing customer expectations.

If I recollect discussions with R. Ramaraj (a founder of Sify and President of ISPAI) on ways to get around the bandwidth glitches. So one fine morning (somewhere towards end of 1999 again), I had a call with him and discussed the idea of setting up a Bandwidth Exchange, as a collective to aggregate the ISPs requirements and negotiate a bulk deal with the Tier 1 carriers ad providers. It was a rudimentary idea to begin with but a way forward nevertheless.

Once we floated the plan within the Association, more ideas popped up and proposals came in from many individuals and companies, who sensed an opportunity in the making. One such plan was from a setup called Band-Ex. It took them two years and a merry ride (by which time I had exhausted all excuses for the delay in setting up an exchange for the ISPs to the media), to realise that the project was a non-starter.

However, despite the many disappointments, we were able to also utilise the delay in gathering new learnings. We were able to study many Internet Exchange models from across the globe and I was especially influenced by the Central Internet Exchange (CIX) in the US model, which led me to convince the industry on the overarching principles on which the Indian Internet exchange points needed to be modelled so as to overcome intra-industry concerns over the proposed project plan.

Two things happened almost simultaneously as well. Around May-June 2002, TRAI got very concerned with the slow growth of Internet and set up a multi-disciplinary Task Force to suggest ways to step up growth. I was a sub-committee co-ordinator on behalf of ISPAI aided by other colleagues from the industry. In the 4th meeting of the Task force held on August 4, 2002, we presented the model for a Neutral, Non-Profit National Internet Exchange of India (I remember being questioned on the name itself, but we prevailed).

On September 9, 2002, TRAI announced that setting up Internet Exchanges is essential to develop the infrastructural capacity and for improving Internet access in India. This was widely reported in the media and drew everyone's attention. The same Task Force announcement also included another recommendation to de-license the 2.4 Ghz spectrum band for free outdoor usage – that perhaps later on led to a spurt in WLAN/WiFi connectivity.

Behind all these developments, there was a dedicated team of experts within ISPAI that had been working tirelessly for months to build up the technical and business model of the NIXI project. Many notable experts like Sharad Sanghi (an ISPAI member, who it turned out fortuitously had previously worked with CIX), Gaurab Upadhya from Nepal (who was responsible for setting up the IX in Nepal, many years before India did!), and others gave so much of their time to us: teaching us, advising, helping us to prepare the models. There efforts were invaluable to India's Internet cause.

Almost in parallel, the Department of Information Technology had been discussing with us, the idea of setting up the Internet Exchange. The then Secretary, R.R. Shah and Additional Secretary S. Lakhshminarayan, played a key role. On February 2, 2003, DIT held a meeting to consider the plan and proposals for setting up 4 IXPs in India. A Task Force chaired by Dr. Ashok Jhunjunwala from IIT-M and me as Convenor, were tasked to submit detail business rules and terms and get NIXI operational by April/May 2003.

The administrative approval for NIXI with a project cost of Rs. 424.35 lakh came through on March 28, 2003. NIXI received its incorporation certificate on June 19, 2003. The first of the four NIXI nodes (at NOIDA) was inaugurated on July 26, 2003 and the first Board Meeting was held on August 4, 2003. Incidentally, agenda item No. 6 of the meeting stated that Ex-officio Additional Secretary, DIT, MCIT be and is hereby appointed Chairman of the Board of Directors of the company till such time as funds provided by government to NIXI would be exceeded by the funds provided by ISPs to NIXI.

This resolution reflected our deal with DIT that NIXI would be 100 per cent run by the industry once it became financially self-sufficient (we had promised this within two years, which it did). The deal never got implemented. Even the CEO now comes from the government administration and not from the industry.

NIXI becomes .IN ccTLD Registry (2004 - 2005)

In 2004, DIT became concerned with the lack of movement of .in, India's country code top level domain names, which was being managed for nearly a decade by C-DAC. The performance had been dismal and we at ISPAI were asked to bring our views to the table.

We, along with some senior executives from Jasjit Sahni-led Net4, reverted to DIT, suggesting a complete overhaul and re-structuring .in both technically and operationally, in line with best global practices and also suggested an organisational structure along with.

Another Task Force report later, I headed a committee with senior officials of DIT to find a globally competent technical service provider. Decisions at the highest ministerial level were obtained and NIXI was given additional mandate to set up and run the .in Registry services, in collaboration with Afilias, which had been running other registry back-ends around the globe for many years.

.IN was commercially launched with a sunrise period in January 2005 and in February 2005; it was opened for individual registrations.

I remained the President of ISPAI and CEO of NIXI till September, 2005, aided wonderfully and working in tandem with some of most progressive and brilliant brains in the industry, government, academia and media, to make many things possible. If I were to sum up all of this decade plus long tenure in the industry, I would say we managed an industry transformation of unimaginable proportions, when many told us that many of our initiatives would never succeed. But we did persevere and overcome.

The EISPAI/ISPAI story is also a story in tandem to telecommunications liberalisation in India, which moved through a very difficult initial path. Many gave up and moved away. The progress may have been slow, but it has been inexorable.

Concerns over the extremely slow pace of Internet penetration in India have been a cause of concern, and as we have seen above, TRAI flagged it even way back in 2001 itself. Despite many such attempts to review and implement new ideas to get the progress going, success has been elusive. India presents an extremely complex canvas, due to its socio-economic and cultural disparities across various geographic regions. Sometimes it seems that this disparity is the main factor that has contributed to slow pace of penetration, since successful Internet economies normally present a more homogenous societal fabric. So do we

live this fact or can we find a way to make Internet meaningful for the larger mass of India? We are still all trying to find the answers.

In summary, having reflected on some aspects of the policy and regulatory progression during the past decade, it is only logical to think ahead, visualise and wish for a future.

In terms of Internet services, 90+ per cent traffic is in the hands of 7 or 8 operators; it should get dispersed amongst a larger number of players, spread across a wider geographic spectrum than it currently is. However, this is easier said than done. Concentration and therefore lack of Internet distribution and dissipation is more a sign of socio-economic factors and as I see it, a little less of regulatory problems, with most enabling frameworks being in place or having been recommended by the sector regulator.

Even if not yet accepted by the government - and some consider it a little late already in the day - there is no harm in seeing issues like unrestricted Internet Telephony for ISPs, Local Loops unbundling, and further rationalisation of domestic and international bandwidth pricing taken to their logical conclusion.

Most dominant ISPs do not have any real incentive of spreading access to the hinterlands, given the perception of less than conducive economic conditions there. Except for recognised A and B geographical areas, it should become free for anyone to offer Internet access supported by the suppliers (the ISPs), much in the same way as anyone can offer a mobile connections from any roadside shop, supported by the respective supplier (the telecom company). This will help generate local demand for connectivity, which would possibly get supported by a common national backbone. One has to think differently and move away from the current licensing silos as the currently exist.

On the back of the developing local access, we could witness a growing movement towards localised data centre and hosting, which is currently not even India-centric. We need to see that content development and local hosting attain a critical point of inflection locally that would help seep ICT down the pyramidal hierarchy, so as to ensure that ICT continues to contribute its fair share of societal benefits and all round growth.

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Suchit Nanda

From Bulletin Boards to BroadBand

Editor's Note

This chapter traces the grassroots growth of the Bulletin-Board System (BBS) movement in India, and its absorption into the global Internet. From analog phone lines and hobbyist communities to commercial licensing and social movements, India's BBS pioneers have dabbled in a range of technologies and applications; some of them eventually became ISPs. They also overcame stifling government regulations in the 1990s to triumph in the cause of community networking. Decades later, today's broadband movement also shares some of the same early concerns of the BBS movement: overcoming digital divides, delivering appropriate content for a range of users, and fostering a sense of community. As compared to BBSs, the landscape of the Internet is much more national and global, but India needs to harness a range of technology options (including mobile and telecentres) and better public-private-people partnerships to empower its citizens via the benefits of affordable broadband Internet.

The human need to communicate is a primal instinct – be it electronic or non-electronic. Much before the Internet got out from the labs and from the hands of the technicians and network designers and turned into the present gigantic network, there was a breed of pioneering computer users who spent their personal time, money and practically all they had into setting up their home computers and phone lines to welcome anyone who wished to connect into their electronic system. This digital communication was done via a modem, over an analog phone line, known as a PSTN (Public Switched Telephone Network) line. Anyone who knew the phone numbers of these computer systems could connect into them and virtually plug into this online community. Leaving messages, sending and receiving files, chatting or playing games were some of the activities done online. This amorphous network grew at its peak into 150,000 systems in North America itself, connecting millions of users around the globe who would login to the systems regularly. These were called "Bulletin Board Systems", or BBSs in short and those who operated these were called "System Operators", or SysOps. With a very humble and non-linear beginning as with most things new, these BBSs grew in number and interconnected to each other turning into large intercontinental networks, storing and forwarding messages, pubic discussions and turning into hubs for file exchanges.

When the Internet grew in popularity into a wider public access system in the early 1990s, the world of the BBSs started to fade, and assimilate into a network that finally turned into the present networked world. The Net as it is today would not be the same without the pioneering work done by those who were part of the BBS community.

Scenario in India

The advent of Internet in India was a low-key, non-attention grabbing event. And the reason was simple, this network was not for the public or the masses but instead limited to a few users in the academic circles under the aegis of what was called "ERNET" – Education and Research Network. Collaborative efforts by a group of computer nerds in the BBS field aimed to bring the benefit of connectivity and networks to the masses. This gave birth to "Live Wire! BBS" which was the first and largest BBS in this region. Its roots lie in a visit to the USA, where I saw groups of kids and adults "wired" to each other over dial up modems (devices which acoustically coupled the computer to the telephone networks). So, on my return in 1989, I set up the BBS. Being a student at that time, with no funds or other support, I had to start small. The initial experiments were with friends, to get a grip on the basics of communication between computers over the unreliable phone lines. Hooking a dial up modem to the phone line, getting two computers to "talk" to each other over 1200 bps modems [that's roughly 120 bits (or characters) of information a second] was in itself a challenge but thrilling. A crucial turn came with a meeting with Raj Mehta, who had a PhD from Stanford University and had worked in IBM. Together we started to find software and get in touch with friends in the hunt for the best BBS software to use. At that time, there was whole alphabet-soup of CBBS, RBBS, PBBS, MaximusBBS, Wild Cat! and a host of other software. Initially, I got started with Wild Cat! BBS software and then moved to Maximus BBS for the richer features but finally came back to Wild Cat! BBS for its new features - and its future Internet integration path, that we recognised was going to be big. This was the humble birth of Live Wire! BBS.

At about the same time, others like Atul Chitnis in Bangalore, and Kishore Bhargava in New Delhi were also working on BBSs. In a short period of time, we all became the watering holes of an eclectic mix of people ranging from computers nerds, to students, to entrepreneurs, or those with special interest and even those looking for an online date in the comfort of anonymity!

Quite early, it became pretty clear that we were onto something big, something so huge that we would be not just pioneers but trendsetters, guiding the future of online India! That realisation made us put in so much more effort. It was also amply clear that to be really meaningful, to go beyond the thrill of connecting electronically one-to-one over a phone line, the system had to be multi-line (more than one user connects at a time), multi-user (not just multi-connect but interact) and grow rapidly to scale to the needs which we were at the same time also instrumental in creating.

That is when I came across FidoNet, which was the world's largest BBS interconnect system and we joined it as national node 6:606/1. At this stage, my brother, Anish joined the operations of Live Wire! BBS and we soon took a decision that LWBBS, which had the humble origins of a shared home-phone line with operations from 10 pm to 7 am would have to get its own dedicated phone line. It is pertinent to note that with one phone line only one user could connect at one time and anyone else would get a busy tone. Effectively, that meant that instead of 10 pm, users would start calling into the home phone line at just before 10 pm slowly creeping into 9 pm, which was when the lower STD rates would start to apply for national-phone calls, disrupting family voice calls (as the phone would be busy for hours). That happened in 1990. At that time getting a new phone connection could mean a waiting list of even up to 7 years! It was our mother's foresight of booking multiple phone lines years earlier as a scarce resource that came to our assistance.

Pretty soon we went from a shared phone line to a BBS that put in a phone line a month in terms of expansion – all this while running out of a personal bedroom in Powai (suburb in Mumbai). Soon we went to 20+ dial up lines (which was pretty big for that time) and a Novel Netware LAN connecting the multiple CPUs to handle the load of all the users. We added a CD-rack for shareware file sharing, a modem rack for better management. Our bedroom soon began to be called the "ring room" as on the 20+ phone lines we would be getting users logging in and out 24x7! The accolades from the 3,000+ active users made it all worth the effort and we continued to expand.

The Growth Phase

With more lines, more modems, more CPUs and network cables the bedroom started running out of space and the LAN soon extended to the neighbouring room prompting - a family member to say that this was like a virus spreading its tentacles in the house so we better find an office space for it. As the quality of phone lines got better, the speeds of modem communication improved with new technology and awareness of BBSs grew. We hired staff, moved out of the home, renting an office space. We also started getting enquiries from other cities. While Atul Chitnis in Bangalore developed his BBS software called CiX and operated his BBS using his own software, Kishore Bhargav used Atul's software and operated the BBS in Delhi.

In the meanwhile, we started getting queries from other cities and pretty soon we trained Gautam Godse from Pune, Roopal Mehta from Ahmedabad, Shamit Khemka from Kolkata, Loyola Joseph and Santosh Narayanan from Chennai, Kishor Rach from Baroda, Gautam Parikh from Vapi and Imran Khaleel and Mateen Ansari from Hyderabad.

In 1994, PCQuest, which was one of the leading computer magazines in India at the time, launched PCQ Online BBS - India's first attempt by a publication house to create an online, interactive service for its readers using a BBS. With its wide coverage, and ability to spread the message of online communication, it started to get a number of users. Meanwhile, other BBSs started to spring up in Delhi and other parts of India. So, using open protocols, I launched BharatNet – an online forum for BBS users in each city, to interact with each other through interconnected BBSs. Being a part of Tom Jennings' FidoNet, we used FidoNet protocols to connect the Indian BBSs to the global BBS network.

Initially this came at a very high price as it required an ISD (long distance phone call) dial up from India to either USA or Singapore for packet exchanges for e-mail and echo-feeds. Later, tunnelling protocols were developed to transfer Fido-packets over TCP/IP. As e-mail started to gain traction, at various crossover points in the network, FidoNet got bridged to the Internet for e-mail. So using a mix of UUCP and FidoNet we started e-mail packet exchanges to send and receive e-mail messages. However, because this was a relay-based system on a best effort basis by volunteers, the emails could take as much as 7 days to reach one way! Still, this was better than anything else – postal letters used to take two weeks and would cost many times more and thus, this opened a new form of global communication.

With expanding needs, new services were launched such as Stock Market feeds, with the help of friends like Janak Sheth. This went from end-of-day updates of all share market prices to hourly updates. The BBS started to become tight knit communities where not just computer geeks but people from all walks of life started to hang out. The communications were largely of two types: personal (like emails from one person to another) and public discussions (messages in open or semi-open forums which would be read by a large number of users).

Innovative services soon started to appear. For example, The Phone Company's Remote Printing Service - Remote Fax - which began in July 1993 as an experiment in remote printing and run by volunteers offered free e-mail to Fax services. At LWBBS, we served as a node for it as well for a period of time in the year 2000 as a public good. Commercial services with low-cost but paid services like eFAX.com (Internet to Fax) sprung up, offering a huge cost saving by carrying Fax messages as e-mail (text) or attachments (scanned). Extending this further, companies started to offer virtual offices. Once registered, a customer would get a postal address, phone and Fax as if they were located in that city. All phone calls would be answered by an answering machine and the voice-files e-mailed to a mail box as also incoming Faxes in near real time. All postal mails would get scanned and also sent as e-mail attachments thus creating a virtual office in, let's say, prime places like Manhattan without leaving your city!

Multi-user games such as TradeWars 2002, WT-LORD (from IceRage.com) and wc-CASINO became hugely popular and competitions were held at regular intervals. Some, like Roopal Mehta of Ahmedabad LWBBS extended the BBS to K-12 (Kindergarden to 12th Grade; www.k12.com) and school networks like KidLink (www.kidlink.org). Usenet newsgroups and IRC (Internet Relay Chats) were other services which were very popular. The growth in the number of BBSs lead to many magazines and e-zines, specially for BBSs, such as the famous Boardwatch, and conferences came up such as ONE BBSCON (later ISPCON) held in North America, which were very well attended.

The interest of the computer fraternity in BBSs did not escape the attention of computer manufacturers. HCL FrontLine, one of the largest manufacturers of PCs in India, launched its Beanstalk series of computers for the home segment in 1997-98. With the assistance of Live Wire! They set up and managed seven BBSs in the major Indian cities namely, New Delhi, Mumbai, Bangalore, Chennai, Calcutta (Kolkata), Hyderabad, and Coimbatore. This BBS network, called Beanstalk BBS, was created specifically for the buyers of the Beanstalk PC.

Seeing the value of this communication at low cost, interest groups started to form. We proposed private networks for corporations including business houses and educational institutes. The revenue helped offset the cost of operating the BBS and we got into the business of setting up communication networks. Meanwhile, APC (Association for Progressive Communications) got in touch with us, through Jagdish Parikh, Leo Fernandez and Karen Banks, to set up a dedicated NGO network. Considering the complexity of running a BBS with all the customer support issues, we proposed to host the NGO network at LWBBS and thus, India-Link was started, with the active support of GreenNet UK which was a part of APC. We also supported YUVA (Youth for Unity and Voluntary Action), CED (Centre for Education and Documentation) and ISI (Indian Social Institute) in setting up their networks. This opened a new world for grass root workers, and those working in the development sector.

Our public good intent resonated with those working for a social cause and the bond with the NGO community started to grow. This led to a contact with IDRC (International Development Research Centre), a Canadian crown corporation working in the development field across the world. With them, we evolved a pan-Asia Networking framework which included setting up BBSs/Internet nodes in developing countries in the Asia-Pacific. Such work would become part of a paradigm later called ICT4D (Information, Communication, Technology in Development). With this exposure, the area of work expanded from India regionally. IDRC through its Senior Programme Officer, Maria Lee Hoon, supported the setting up of e-mail/BBS/Internet services in Mongolia, Cambodia, Sri Lanka, and Laos. This lead to many more interesting projects and a relationship that continues till date.

Assistance to the BBS SysOps came from a number of sources. For example, Harish Pillay, a second generation Singaporean of Indian descent, ran a UUCP node in Singapore called temasek.uucp which was online in 1991. This node connected to various others in Singapore, including the Linux Users' Group (Singapore), and became the gateway to the systems in Bangladesh and Nepal. These countries used to dial in via a 9.6 kbps modem connection into temasek.uucp which was run out of Harish's home!

Many others in the US offered similar peer arrangements, largely as a goodwill gesture and with the objective of spreading the culture of BBSing. Organisations such as Drik set up by Dr. Shahidul Alam formed DrikTAP with the help of Toolnet in early 1994 and DrikISP to foster exchange of information. Prof. Dr. Muhammad Yunus (of Grameen Bank fame, later to become a Nobel Laureate) created Grameen CyberNet Ltd. (GCL) to extend the benefits of the Internet in Bangladesh. There were other similar initiatives in Nepal, Sri Lanka, Thailand, Singapore and Malaysia. The culture of online communication was growing rapidly.

E-mail Licensing Policy

With worldwide awareness of e-mail and value of communications and looking at the success of CompuServe and AOL in the US, some in India wanted to work on those lines. The Business India group, with the support of Anil Garg (who was earlier with NCST) setup aXess©, a commercial e-mail and information service targeted at the business community. A tie up created SprintRPG for similar services and others like DART, GEMS, and ICENET also jumped into the fray. With business communication came the need for reliability and QoS. In their wisdom, a few approached the DoT (Deptartment of Telecommunications) to issues a license to operate e-mail services. What they did not ever imagine were the stringent terms and conditions that would come with an e-mail policy. On March 2, 1994, the DoT issued the "Value Added Services Licensing Information", which amongst other conditions required a fee of Rs. 2.5 million for the first two years, going up to Rs. 3.5 million for the third and fourth years followed by Rs. 5 million for the fifth year.

Unfortunately, this carte blanche policy would have meant that all BBSs would have to shut down as most were home-run or low-cost operations. Fortunately, the BBS community had grown to a few thousand and rallied together against this. With a very active media participation, including the support of international media (such as The London Guardian), a very vocal BBS community and the likes of th Electronic Frontier Foundation (EFF) throwing their weight behind it, the DoT did not enforce the policy. This was probably the first instance of electronic advocacy in India and that too with quite a positive result. The license raj in Indian e-space was nipped in the bud!

Launch of Public Internet Service

With the growth of the Internet around the world and the advent of WWW (World Wide Web) but no move to change the restrictive nature of Internet in India, a few from the BBS community rallied through media, public awareness and personal contact to try and change the prevalent scenario. Till this time, the Internet facility was either in use by a very limited number of educational and research facilities through ERNET or through other very limited access facilities like NIC (National Informatics Centre), STPI (Software Technology Parks of India), or highly expensive corporate leased lines. There was no service for the public at large. What was needed was a government body that had the will, would not be limited by the prevailing restrictive policies in place and who could take on the might of the DoT officials.

VSNL (Videsh Sanchar Nigam Limited) fit this perfectly. It was the only authorised international carrier (back hauling voice and data) and which did not fall into the policy tangle. A few of us initiated a dialog behind the scenes with B. K. Syngal, CMD, Amitabh Kumar, Director Operations, and Neeraj Sonkar, who launched the first public Internet service on 15th August, 1995. This was a major milestone that made public Internet access available to anyone for a fee.

While credit goes to them for taking this bold step, even so, they too seemed unable to realise the magnitude and scope of what they were doing. In the non-official pre-release discussions we learnt that they were going to launch the services with 32-ports! At that very same time, I was running the largest BBS in this region with over 20+ phone lines. A national service should not have been anything less than at least 10 times that, at the very least in each major city. Jokingly, but with good reason I told them that they would not have 32-ports but just 31 as I would be logged into one and not logout! The message made impact and when confronted with the fact that there were hundreds and thousands waiting for this service in India they thought to make amends. They offered me a consultancy and along with my friend and colleague Sharad Sanghi, who had an enviable track record in setting up ISPs, network designs and backbone routing, we helped VSNL in their GIAS (Gateway Internet Access Service). The GIAS, as expected was a runaway success and nodes were soon started all over India.

Today the network is widely known as the Global Village. On the BBS, conversations were done more like local village chats around a fire or a watering-hole – slow and at their own pace, where everyone knew everyone else and also their mothers and fathers. With the Internet, communication became more impersonal. People knew each other as User-IDs and not sensitive humans at the end of the keyboard, and this anonymity lead to the start of loss of etiquette of online communications and often led to trolls and flame-wars which generated interest and traffic but also ruffled feathers and sometimes lead to bitterness and hurt feelings. One still gets nostalgic and misses the warmth and feeling of comfort of the small huddle that BBSs used to be!

ISP Policy

Monopolies are never efficient. With the taste of Internet through VSNL's services, we soon rallied for an open ISP policy that permitted private players to become ISPs. The fruits of these efforts resulted in the DoT's ISP Policy in 1998 which was quite balanced. With no license fees for the first five years, other than a bank guarantee, and a three-tier approach (national, major cities, smaller cities), hundreds applied for an ISP license. LWBBS, Pune, which went by the name of JabberWocky was the first ISP licensee, followed by Satyam (which was the first Cat `A' national) licensee. At Mumbai too we applied for and received a Cat `B' license to operate. Over 300 ISP licenses were issued in a short period of time. Meanwhile, the global BBS landscape was changing as well. Wildcat! BBS, a product of Mustang Software Inc became WINS (Wildcat! Interactive NET Server) offering BBS+Internet service offerings and also in 1998 changed hands to Santronics Software Inc. Interestingly, in 2011, this product is still available and continues to sell.

Entry of Set Top Boxes as Alternate Access Devices

With the improvements in phone lines and more availability of Internet through various ISPs, there was recognition that it was the cost of the access device of the PC in the Rs. 30,000 range that was the limiting factor for large adoption of Internet. With a tri-party equity participation between Infoquest E-Commerce Pvt. Ltd., Salora International Ltd and Nanda Netcom Pvt. Ltd. (LWNET), a new company Jadoonet.com was launched, which was focussed on bringing low cost access devices to the market.

While the cost of the access devices was in the range of Rs. 10,000 to 12,000, with a captive portal and advertising based revenue model, the device was sold at a subsidised price of under Rs. 5,000. With a tie-up with Samsung Electronics Ltd., the product was made available across the country in 55 cities, thus rapidly bringing Internet within the reach of the masses. By this time national access codes were available to ISPs to enable local calls routed through to the ISP nodes which could be located anywhere in the country. Thus a low cost (below Rs. 5000) device called the Set Top Box (STB), could be connected to a TV, and the phone line with local calling to could get Internet access for the purpose of the three basic Internet facilities namely: e-mail, browsing and chat.

Seeing the success of Jadoonet, others like Videocon International launched `Vnet' for Internet on TV, priced at Rs. 6,990 and Philips launched Web TV Box. Samsung also integrated the Jadoonet STB by incorporating it within the TV itself and selling it as a combined product. One of the issues for the STB not taking off in very large volumes was both the awareness of the Internet as well as the technical limitations of putting more features on a device and needing constant upgrades to keep up with the changing software. Although the devices had the ability to upgrade over the Internet, the limitations were always catching up and the fast changing browser market meant that functionality was one step behind the PC options.

Others started to look at this problem in different ways and that was the genesis of the SimputerTM. The SimputerTM started out as a low cost handheld device that could connect to the Internet and thus try and bridge the digital divide. However, the announcements and the media campaign were ahead of product development and the cost over runs eventually faded this device into oblivion. At the same time, Jadoonet.com signed an MoU with Intel to develop a high end STB which would have the power of a PC and closely emulate the features of the personal computing devices for Net on TV.

With so much happening on the Internet front, a great number of players entered, without the requisite expertise and rigour, setting up a variety of online companies called “dot com” businesses. The euphoric valuations, IPOs and funding support lead to a runaway and unrealistic model which would eventually collapse. The global "dot-com bubble bust" (or sometimes called "IT bubble bust”) happened in 2000. Overnight, the darlings of the stock markets and the big ticket money spenders lost their backing and the down cycle came in full strength. Many projects got jettisoned between the Y2K (millennium bug) and the Dot Com bust. Jadoonet.com, although well grounded, was also impacted by the large market sentiments.

In 1996, Larry Ellison had the foresight to declared that "the Network is the Computer". From 1996 to 2000, Oracle - which trademarked the term Network Computer (NC) - started advocating the use of diskless desktop computers (or thin clients) that pushed computing to the network or server side. This brought back memories of the old mainframe days with dumb terminals. The idea did gain traction but was probably ahead of its time. Sun Microsystems developed the JavaStation. IBM developed the IBM Network Station and many others joined the fray. Meanwhile Microsoft pushed their MSN TV (formerly known as WebTV) which was a combination of thin client and STB for Net on TV. AOL, RCA, Sony, Philips, Samsung and Mitsubishi developed and marketed their own products.

One of the key dependencies in the Internet adoption was the access and reliability of the phone line and dial up connections. Much like the cable TV growth in India, and in many cases by the same teams (they knew how to wire buildings well and to swing cables from roof tops to avoid digging roads and getting legal right-of-ways), cable Internet started to grow. Unlike the West where cable Internet meant Internet on coaxial cables, these were largely Ethernet or extended-Ethernet networks which later became PPPoE (Point-to-Point Protocol over Ethernet) networks. Potentially within the LAN+WAN, the speeds were great but the bottleneck was the back-haul which was expensive and slow.

With mobiles, and corporate communications apart from Internet pushing for larger bandwidth, many companies went into the business of laying optical fibre cables. With so many getting into the fray, needless to say, there was plenty of dark fibre. The bottleneck thus became the international gateway and long distance connections.

Another contentious issue was that all major ISPs were taking bandwidth pipes to USA where most of the traffic was flowing but very few interconnected with each other. Thus even between ISPs, the traffic would flow on expensive international circuits making long and expensive journey over already limited resources. In July 2003, NIXI (National Internet Exchange of India http://nixi.in/) was set up as the neutral meeting point of the ISPs in India. Its main purpose was to facilitate exchange of domestic Internet traffic between the peering ISP members. With this, speeds within India via ISPs improved and costs came down, and this arrangement continues till date.

In January 2004, Reliance Infocom acquired Flag Telecom for a valuation of US$ 211 million for a control of 100 per cent equity of the company. Flag was at that time the largest cluster of private undersea cables spanning 65,000 Km and this was integrated with the 1,10,000 km domestic OFC capacity that was being laid by various entities. So, from a bandwidth deficient, we went to over capacity in the major trunk route of India and also competitive pricing in the international bandwidth markets. Later, other companies such as Bharti AirTel and Tata Communications invested in other networks such as the SEA-ME-WE-4, in an international consortium of under sea cable network.

In 2009, Seacom announced its completion of its 1,28 terabytes per second, 17,000 km submarine fibre-optic cable system linking Southern and East Africa to global networks via India and Europe. Without this, the BPO business would never have got off the ground. As part of Infoquest, we invested and ran Nittany Decision Services, Chennai, which was one of the earliest BPOs in the country. Today this concept is extending to our rural areas and creating job opportunities.

Meanwhile, in February 2002, the Tata Group acquired 25 per cent stake with an offer to buy a further 20 per cent stake in VSNL (monopoly overseas phone service provider), and Ratan Tata became VSNL's Chairman. In December 2007, VSNL became Tata Communications.

Digital Divide – Digital Haves and Havenots

With so much of commercial activity and empowerment through technology, and its uneven rise, there was a growing concern on the "digital divide" (a term first coined in the mid-90s). Many organisations working in the development community started to take a keen interest in addressing this issue and finding a solution. Through the NGO network, my association with IDRC (International Development Research Centre), APDIP (UNDP's Asia Pacific Development Information Programme), UNESCO, ORBICOM (international network of UNESCO chairs) increased.

IDRC, particularly, was a leader in this space and played a pivotal role in this region. The biennial Digital Review of Asia Pacific (DirAP), which is a comprehensive guide to the state-of-practice and trends in information and communication technologies for development (ICT4D) in Asia Pacific, chronicled and tracked some of this. I served on the Editorial Board of DirAP, since its inception. What is particularly of interest is the cross-cutting analysis of all the countries and the state of development. This publication can be downloaded, in full, at no cost from the Internet.

Another noteworthy organisation is MSSRF (M S Swaminathan Research Foundation). Prof. Swaminathan has always held that technology can play a crucial role in the lives of people. He was one of the early adopters of ICT4D and a programme he started in the villages of India just completed ten years. Starting from HAM to packet radio right up to a tie up with ISRO's satellite capabilities, he has clearly shown that the benefits of technology, such as Internet can be a game-changer and opens up a full spectrum of opportunities.

Another staunch believer is Nobel Laureate Muhammad Yunus, famous for his microfinance concept but also widely known for his Grameen Internet, Grameen Telecom and many other technology initiatives. Recognising that without fast, reliable and low cost communication India would be left behind, Mukesh Ambani, a staunch believer in the power of technology as an enabler, launched Reliance Infocomm to bring mobile communications into the reach and hands of everyone. Soon Reliance Infocomm became one of the largest mobile companies in India, dropping the cost of communication to half of the prevailing rates and offering data services and Internet on mobiles right from the start.

Broadband

Wired and wireless broadband Internet is going to be the next big thing. While mobile communication (primarily voice and SMS with some data) has seen incredible growth in India, broadband connectivity has not been taken up in earnest.

India, with a population of over 1.2 billion has just 1.5 million broadband connections - that too when the Indian government classifies Internet speeds greater than just 256 Kbps as broadband! That broadband penetration is not even 1 per cent of our population. In contrast, the number of cellular phone subscribers reached a very comfortable 10 per cent of its population in a shorter period of time. It is also interesting to note that the top 5 players in the market have over 90 per cent of the broadband market in India. The break up of the broadband subscribers is: ADSL (83 per cent), cable (10 per cent), Ethernet LAN (3.4 per cent), and fibre (1 per cent)(source: draft recommendations for growth of broadband in India). In contrast, there are 71 million cable TV subscribers in India.

In the spectrum auctions of 2010 for broadband wireless, which rose close to US$ 8.5 billion, Qualcomm Inc. and Infotel Broadband (Reliance Industries Ltd.) made the winning bids and have rolled out a sizable investment plan which is believed to be in the order of US$ 770 million to US$ 1billion in their respective Indian BWA (Broadband Wireless Access) ventures. While Qualcomm secured Kerala, Haryana (including Delhi), and Mumbai, RIL is the only pan-India license holder for BWA on 4G. Reliance had outlined the India broadband opportunity at 100 million subscribers and 6-7 billion USD revenue by 2014 and targeted cash break-even in three years of service rollout.

It is to be seen how the WiMAX verses LTE technology tussle is handled. What is clear is that while 3G is just about rolling out, within 18 to 24 months, 4G deployment will start across India giving 10 mbps speeds (and more) on wireless. However, as of now, one of the limitations of 4G will be that the policy only permits data and not voice-interconnects. Voice within 4G is permitted.

In 2010, the government of India announced a National Broadband Plan (NBP) with the aim of connecting 160 million households compared to an estimated 10.3 million connections as on date, at speeds up to 10 mbps. The NBP proposed by the Telecom Regulatory Authority of India (TRAI) is an estimated investment of INR 600 billion (US$ 13billion) and TRAI hopes to have 60 million wireless broadband, 22 million DSL and 78 million cable Internet users, by 2014. Quite ambitious by any standard!

The proposed plan is to set up State Optical Fiber Agencies (SOFA) in each state that will be under the state government and a National Optical Fiber Agency (NOFA) under the Central government. Minister Kapil Sibal has announced that a blue print for the National Broadband Plan will be in place by March 31, 2011. Very high speed broadband through Fibre To Home (FTH) as demonstrated in countries like Singapore and parts of USA can help bring convergence to a variety of services delivered to the homes including telephony, Internet, video and edutainment.

A number of promising impacts are expected as a result of this initiative.

- With the advent of mobile broadband services, distribution such as downloads, streaming and music subscriptions will proliferate. Mobile gaming is projected to grow from a size of INR 2.5 billion in 2008 to an estimated INR 12 billion by 2013; translating into a CAGR of 36 percent between 2009 and 2013.
- Mobile broadband would also play a role in integrating rural India with the rest of the country and help widen markets, create better information flow, lower transaction costs and help in education, health-care and e-services. Through effective utilisation of various mobile broadband based services, farmers are likely to save approximately INR 6 billion in 2015.
- Using Unique ID, a customer who has a mobile phone will be able to open a mobile-linked no-frills account.
- Mobile banking transactions are expected to exceed 340 million in the year 2015, resulting in cost savings of approximately INR 11 billion.
- Digital music sales are expected to grow at a CAGR of 24 percent between 2009 and 2013 to reach INR 3 billion in 2013, with a large part of it going to mobile phones.
- Despite current slow up take, online advertising in India is expected to grow with CAGR of 32 percent between 2009 and 2013 to touch Rs 20 billion in 2013.
- Rollout of 3G will lead to additional revenue of approximately INR 90 billion, over the period of 2010-2015, for the IT and BPO industry, including rural BPO services.
- At least 50 to 60 percent of government information services in India can be delivered through mobile phones, increasing awareness and improving productivity.

The Future

As per Wikipedia sources, India has the world's third largest subscriber base of Internet users with 100 million users (of whom 40 million use the internet via mobile phones) as of December 2010. Yet, Internet penetration in India is one of the lowest in the world at 8.4

per cent of the population, compared to other nations like the US, Japan or South Korea where Internet penetration is significantly higher. While the number of broadband connections in India has seen a continuous growth since the beginning of 2006 and stands at just over 10.5 million at the end of October 2010, there is clearly a long way to go. While India boosts the cheapest cellphone prices, broadband in India is more expensive as compared to Western Europe/UK and US. This will certainly change in the coming months as large scale roll outs take place, both in terms of wireless broadband (4G) and efforts to take fibre to the panchayats (villages), under a planned government initiative.

Internet Growth: Recommendations to Government and Industry

- Recognise data networks and Internet as critical national infrastructure, like roads and ports
- Encourage investments in growth and penetration by promoting both ISPs and telcos to make affordable and reliable connectivity across India.
- Encourage building of local content in local languages with emphasis on capturing and making available traditional and indigenous knowledge
- Use national resources to accelerate penetration, eg. copper wire, spectrum
- Be technology agnostic for multiple forms of connectivity
- Promote proliferation of access devices to suit budgets and user needs
- Bridge the rural-urban divide
- Technology can be a great leveler; use PPP models for delivering G2G, health, education, localised information
- With connectivity improvements in rural India, growth will shift and the pressures on urban areas will also reduce. Wealth will have a more equitable distribution. India sits between Europe and South Asia, and can serve as a hub and gateway.

What is needed is open and transparent policies which accelerate growth and encourage PPP (Public, Private, Participation). The regulatory environment should judiciously balance the various elements. For example, even today, VoIP or Net Telephony over Internet is not fully permitted and one can not derive maximum benefit by offering Internet to cellular/land-line connectivity. Thus, services like Vonage, Net2Phone, and Skype-Out have not yet started out in India, which is ironical, as calling the US from India can be cheaper than within!

We have a lot going for us. As Mukesh Ambani, CMD, RIL said: “Our fundamental belief is that for us growth is a way of life and we have to grow at all times.” The Economic Times reports that the number of Indians over 15 years of age accessing the Internet rose by 7.8 per cent in Q2-2006 to 18.02 million, from 16.71 million; these are dramatically higher now. America has retained top slot with 153 million users according to comScore. China and Russia followed India with 5.22 per cent and 5.14 per cent rise in its Web users respectively. With all the new initiatives, we will soon be in the top position. Internet penetration in India will increase further in the next few years and this is visible from the rate at which Yahoo and Google are localising their online properties for the diverse population of India. So far Indians to a very large extent access the Internet in English. Content in local language can dramatically change the adoption rates and bring the benefit of Internet to the large masses.

With high speed Internet through FTH or BWA, there will be a convergence of education, entertainment, gaming and new services. Video will be the next big app. With airport security and travel issues coming in the way, videoconferencing over the Net (which already happens on Skype, Yahoo Messenger and dedicated services such as WebEx) will grow. Social networks such as Facebook, Twitter, MySpace, Orkut, Linkedin and blogs will be boosted with live feeds, video clips, photo-sharing, and interactivity. VR (Virtual reality) may finally become a common reality. High end multi-user games which add realms of reality-like feel will be the norm.

Giga networks currently deployed for collaborative working in educational institutions will get wider adoption. Apple's push for slimmer devices and Google's drive for more network based and larger and larger spaces will enter a sweet spot. Microsoft is already offering its legendary cash-cow Office product as an online app on pay per use. Video-on-demand and pay-per-user will move out of the limited role into mainstream. Already the business models of companies in DVD rentals, like Netflix, Blockbuster Video, Walmart and Bigflix are being impacted. Much as photography was impacted, wherein today more photos are taken on mobile phones than on cameras, and video can be shot on still cameras, the power of broadband Internet will change our lives. The ability to upload straight to Flickr or YouTube or Vimeo and other services would change the way we interact.

The news industry has been impacted by street journalists or citizen journalists, and in much the same way other industries and businesses will also be impacted. Handheld devices, be it mobile phones, tablets or hybrid devices will fundamentally alter the way we interact, and experience the world. Location based information will open up the market for innovative and interesting services.

At the same time, our digital lives would have to be guarded more carefully. Greater emphasis will have to be paid to privacy and security and law enforcement officials will have to be constantly updated to tackle new challenges posed by unethical hackers.

We will also have to focus concertedly on rural India and those living in the hinterlands. With 70 per cent of India living in rural-India and dependent on agriculture, our efforts to bring the benefits of technology to them would be all the more important. That is why I am now focused on working in the Reliance Foundation, a large philanthropic entity of Reliance Industries. Reliance Foundation is closely working on bridging the divide between a rural Bharat and an urban India in a programme called BIJ (Bharat India Jodo). Through the use of grass root information, the best domain-knowledge experts and appropriate technology for a public good, the Foundation hopes to impact areas which matter most: agriculture, health (telemedicine) and education (distance learning). Technology can play a crucial role in this endeavour.

Studies have shown that Internet growth and penetration, has a direct positive impact on national GDP. Simply stated, technology is tied to economic cycles and major technological revolutions can be tied to productivity, which is linked to the standard of living. So, economists concur that major technological changes like the introduction of electricity, automobiles and Internet positively impact the lives of people on this planet.

As we walk down memory lane, it is quite clear that the root of Internet in India lay in many small and big initiatives stemming from a variety of efforts in creating a range of Internets in India. As we dig deeper into the decades, it becomes increasingly clear that there is no homogenised Internet that has evolved in the country – a one size fits all. Instead, much like the rivers, what we have is a technology which, through its interactions and intersections with various objects, people, contexts and regulation, has emerged in many different ways and many different forms.

These pluralities of the Internets, much like the pluralities within India, constitute its strength; their shaping from the past has meaningful bearings on the future unfolding of these technologies. As we move from BB to BB (Bulletin Boards to Broad Band) we are in a sense coming full circle. What was important then in terms of content, needs of users, quick communications and low cost still holds true. After a phase of trying to get connectivity to the masses we are once again going to have to focus on these basic principles, to take the benefits of technology to multi-stake holders, cutting across all strata of society.

So far we have been in Bharat beta-version and with all these technology developments, we are moving to India 1.0. So what will take us to the real thing? The stable version: India 2.0? When equitable, sustainable, and bottom-up growth takes place in an environment which is corruption-free and transparent, when issues of poverty, hunger, education and health are addressed, only then would we truly arrive as a country and a globally responsible leader-state worth emulating; thus fulfilling the vision of our noble leaders such as Mahatma Gandhi, who so famously said, "India lives in its villages." India, which has been a cradle of humanity and a birth place for spiritual values, can once again be a shining star and role-model to the world as a whole.

References

The BBS Documentary
http://www.bbsdocumentary.com/
http://en.wikipedia.org/wiki/BBS:_The_Documentary/
http://www.archive.org/details/BBS.The.Documentary
BBS: The Documentary (commonly referred to as BBS Documentary) is a 3-disc, 8-episode documentary about the subculture born from the creation of the bulletin board system (BBS) filmed by computer historian Jason Scott Sadofsky of textfiles.com.
A Brief History of Bulletin Board Systems BBS
http://www.powershow.com/view/af45-NWMyN/A_Brief_History_of_Bulletin_Board_Systems_BBS
Boardwatch (BBS Magazine)
http://en.wikipedia.org/wiki/Boardwatch
Big Dummy's guide to Fidonet
http://www.fidonet.us/dummyguide.html
FidoNet: Technology, Use, Tools, and History by Randy Bush
http://www.fidonet.org/inet92_Randy_Bush.txt
FidoNet List
http://www.rxn.com/~net282/
TEXTFILES.COM is about archiving and saving the textfiles of the 1980's, and about up-to-date essays and commentary about that time. http://www.textfiles.com/history/
Milestones in India's Internet Journey by Amit Ranjan
http://www.amitranjan.com/2005/08/31/milestones-in-indias-internet-journey/
Connect: A Look At Bulletin Board Systems
http://www.youtube.com/watch?v=ESaTREAAzww
ERNET
http://www.eis.ernet.in/
The Guide – The Guide to India's Internet Services by Dr. Raj Mehta, 1997
http://guide2net.net/bookweb/Guide_web/HCh02/ch02.htm
Outlook White Paper: Private Internet Service Providers in India by Anindo Ghosh. 1998
http://www.india50.com/isp.html
A brief History (of Internet) by Bnet Services
http://www.bnetindia.com/html/isphist.htm
WINS (Wildcat! Interactive NET Server) developed by Mustang.com Inc and now owned by Santronics Software Inc. offers BBS+Internet facilities. http://www.winserver.com/public/default.wct http://www.santronics.com/
Simputer
http://www.simputer.org/

DirAP (Digital Review of Asia Pacific)
http://www.digital-review.org/
The Phone Company's Remote Printing Service
Remote FAX - http://www.tpc.int/
Began in July 1993 as an experiment in remote printing. Run by volunteers and we (LWBBS) served as a node for it as well for a period of time in the year 2000 as a public good.
Reaching the Unreached
ISBN: 978-81-88355-15-0 Suchit Nanda and Subbiah Arunachalam published by Jamsetji Tata National Virtual Academy (NVA) M S Swaminathan Research Foundation, Chennai, India.
http://www.photonicyatra.com/Features/Reaching-the-Unreached/

Suchit Nanda is advisor to the Chairperson, Reliance Foundation, a philanthropic organisation in rural development, education and health. He is the founder and CEO of Nanda Netcom and Online Services, and has a rich experience having pioneered the online system (Live Wire! BBS) in the Indian subcontinent and one of the earliest ISPs, Live Wire! Net in India. He has consulted on ICT4D to IDRC, UNDP, and UNESCO. He did his B.E. (Electronics) from Bombay University. In 1991, while still in college, he co-authored `War On Virus,' a book on computer viruses. In 2000-1 he joined the Board of Directors of Ideaventures which set up Jadoonet.com, a company that developed the first STB (Set Top Box) in India featuring Net on TV. Suchit is on the editorial committee for Digital Review of Asia Pacific (DirAP) and has authored a number of books and magazine articles. Suchit has travelled extensively and is a keen photographer and has held photo-exhibitions in many countries (http://www.photonicyatra.com).

Chapter 7

B.G. Mahesh

From NRIs to Indians to Global Citizens

Evolution of the Indian Presence on the Internet

Editor's Note

This chapter traces the growth of the Internet as a popular medium of communication among NRIs in the 1980s and 1990s, and the Internet content boom in India after 1995. From email and Web to mobile and social media, the "killer app" of new media has surely evolved. The dot-com bust separated the serious players from the rest of the pack; sites such as Naukri.com and Shaadi.com seem to be joined, more recently, by travel portals for air, train and bus ticketing. Consumer social media (e.g. Facebook, Twitter and blogs) is booming and corporates and government agencies need to embrace such social medias pro-actively. Although there is much hype about mobile Internet as well as emerging tablet-based services and apps, PC/laptop-based Internet also cannot be ignored. Venture capital investors and startups need to work together to add scale to India's Internet industry. The Internet industry in India is also bound to grow rate at a much faster if the advertising world accepts it as a serious medium.

As one of the early and active Indian users of the Internet, I used the medium to publish India related content. At that time in the early 1990s, I was based in the US and felt the Internet provided a perfect platform for the Indian diaspora, who were always looking for news about their country and their city. In the 1990s, the media houses like the Times of India, the Economic Times were early movers in this space. The first independent portals were started up by entrepreneurs and eventually corporatized Indiaworld (now part of Sify), Rediff and Sify.

The Internet in India was prohibitively expensive in early 1990s. The only form of Internet connection for consumers was the dialup, not just in India but even in the US. But the speed of dial up in the US was much higher than India. Also, it was not that easy to get a dialup connection in India. One had to stand in those long lines at the VSNL office, as they were the only ones providing dial-up connections initially (then a government enterprise, now owned by Tata Communications). Later on, many joined the bandwagon include Bharti's Mantraonline and Wipro's NetCracker (both defunct now).

I should say media houses in India were reasonably quick in joining the online bandwagon. They did it mainly because it provided them an avenue to cater to the Non Resident Indian (NRI) population that had adopted the Internet more quickly than Indian citizens in India. It is safe to assume that over 80% of the traffic on all portals of Indian content providers was from outside India, during the mid and late 1990s.

Users in India got an Internet connection mainly for using email. Web usage did follow quickly but very few Indians felt the need to access news sites on the Internet as they had easy and cheaper access to the physical paper.

Online News: Mahesh.com

Before the World Wide Web came into existence in a big way, I was using the Internet through Usenet. Many Internet users today might have not have even heard of the Usenet. In hindsight, it may now be termed an 'early form of social networking', without having to connect directly with each other but via shared text feeds and discussion groups. There were many ways to access Usenet; I chose to access it through a site called DejaNews.com which ultimately got acquired by Google (now it is groups.google.com).

I was always interested in the news media. When in college, I was the only one at my hostel in Mysore subscribing to India Today magazine. Most of them thought for a teenager to be reading a 'mainstream' magazine was abnormal! When I went to the US for my higher studies, I immediately subscribed to the North American edition of India Today.

When I got introduced to Usenet, I was fascinated by the reach it had – you could ask any question and people had an answer (there was no spam during those times!). Majority of those participating in Usenet were from universities because we had easy access to internet and it was free!

I observed most of the users were asking questions on Usenet. I wanted to be active in providing answers. Typically, questions in the US were related to calling rates India (ISD), courier rates to India, sending money to India and a topic which hits every Indian abroad – immigration. I started preparing FAQs (Frequently Asked Questions) on all these topics and started circulating them on Usenet (you can regard it as emailing to a large list).

I moved from here to the next step – I asked myself, 'Which are the popular sites related to India one would love to access?' I started an Indian site directory which had the list of all Indian sites categorised and clustered. The US immigration FAQ I authored, now is hosted on Immigration.com.

During those days you could reserve domain names for free, there was no yearly fee. I had to think of a name for my site. I was not an expert marketer and couldn't think of a good name and so decided to just name it Mahesh.com! I hosted this as Mahesh.com which became the default homepage of almost every NRI during the 1990s!

This humble site and my subsequent ventures like OneIndia actually made three important contributions to Internet space in India. We were among the first players to have introduced a portal for Indians. A recent IMRB report says, language has been a hurdle in getting Indians online; we at my venture Oneindia.in, believe that we have been a part of the solution, though a lot more work is yet to be done. We also facilitated the introduction of Indian languages on the Internet. We gave netizens the content they wanted in the language they preferred. We started off by quenching the 'language thirst' of Indians.

We were also one of the only portals that grew without venture capital funding, but we could surely have achieved a lot more with invesments. I believe many have seen us and told themselves "We can also grow because of what the product has to offer."

The Dotcom Boom and Bust in India

The US saw a dotcom boom in 1999 and the Internet industry in India did not want to lose the opportunity. I co-founded my first venture Indiainfo.com in 1999; we were working hard and growing organically. Rajesh Jain's Indiaworld got acquired by SIFY in November 1999 and that made this space a lot hotter. I recall a few portals like chaitime, eindia, go4india, indya.com starting during those days. I really was not really worried about them but they surely got my attention.

By June 2000, we saw the dotcom bust phase. Most of the portals I have mentioned above are gone or no longer purely in that portal space. Media always wants something hot to write about, and dotcom was an easy target - maybe rightfully so. I do not think the Internet sector behaved responsibly across the world, why blame just the Indian internet sector? India Today carried a cover story "Doubt Com" in July 2000. Literally every Internet venture was criticised in all the articles. I was glad I showed my commitment and true passion by continuing to focus on what I was building and clearly showed we were not a 'fly by night operator'.

Post this burst, I recall how difficult it was for my colleague Sriram Hebbar to get revenues for our portal. And we were offering content in Indian languages, seen as a big no no by many industry players. Fortunately, we stuck to our passion and have made Indian languages big online via Oneindia.in.

For few years Venture Capitalists fully abandoned the Internet industry in India. Very few Internet companies started till 2005/06; they were only shutting down. Early players like naukri.com, bharatmatrimony.com, shaadi.com are doing great business now because they believed in the long term game. Post 2005, we saw travel portals getting a lot of prominence – makemytrip.com, cleartrip.com, yatra.com– all of these are very significant players in the Internet industry today. Most of these old Internet portals invested into the product during the downtime, a perfect recipe for success.

In 2010, the internet 'flavours' are e-commerce and social media. I believe ecommerce is a more long-term viable space.

E-commerce and Social Media

As the Internet experience stabilised, education, travel portals and classifieds (especially jobs) saw a huge following, especially in urban India. As the economy grew in India, the air travel Industry saw tremendous upswing. Airlines like Air Deccan provided an opportunity for the common man to fly, instead of using the train/bus at near similar cost of a train travel. And these airlines forced you to book tickets on the Web as they wanted to automate as much as possible. There was no concept of getting a ticket offline for many budget airlines. Many passengers were forced to use the Internet to buy airline tickets and the entire air travel portal segment saw a huge surge in usage (and valuation!). Today we are proud to see an Indian travel portal Makemytrip.com on NASDAQ. I think there will be many more to follow. Also, let us not forget to acknowledge that the founders of Naukri.com had a successful debut in the Indian stock market.

While many chose to fly, India has enough population to still fill the trains. Even now Indian Railways is the largest ecommerce portal in transactions. The Railways are doing a great service by offering ticketing online; no more standing in those long queues just to find out the status of ticket availability.

MapMyIndia.com has been one of the early and few players who went into the GIS space. They have adapted themselves well with the new opportunities that came their way and today their GPS Navigator is a huge success. Car manufacturers are recommending every new car to have this navigator.

Recently the erstwhile search engine player Lycos was acquired by a Hyderabad based digital company Ybrant Digital. Could you have believed that such a thing would happen even a few years ago?

Komli, one of the leading online advertising networks, has been on an acquisition spree. They bought similar companies in Australia and UK. A new breed of bullish Indian e-entrepreneurs has emerged. This indirectly is giving a lot of confidence to the start-ups these days.

Web 2.0 and Social Media in India

Orkut and Facebook spurred the usage of social networking amongst the masses while LinkedIn saw traction from professionals. Online education will be very big as Indians are very particular about being educated from good schools. Online education these days is available for free from premier institutes all over the world.

Indians are entrepreneurs by birth. With the Internet we waste no time in implementing ideas in India which have worked in the US. Web 2.0 did bring in a new direction to portals in India. The latest flavours of the day in social media across the world are Twitter and Facebook. Both of these attract noticeable amount of traction from India. The youth in India are very active on Facebook; possibly you can see a little more maturity on Twitter (because you can speak just '140 chars' which may be very little for many!).

Politicians, celebrities, FMCG companies and telcom companies have embraced both Twitter and Facebook. I believe they do not have a choice; everyone needs to reach out to the consumers, else the consumer is gone to your competitor. But you do see a good amount of activity at an individual level on the social media. Professionals have embraced LinkedIn.com, but the Indian versions of professional networking sites have not taken off as yet.

Youngsters in India have been quick in recognising the gaming opportunity on these social sites. A pair of Kolkata based brothers developed a scrabble like game for Facebook and became quickly the most popular game on Facebook. Due to trademark issues the game was re-launched as Lexulous. What is important to note here is that we are no longer afraid to be seen as a popular, successful player in the world market.

Even amongst celebrities, very few have crossed 100,000 followers mark. Celebrities have tweeted responsibly; you rarely find garbage talk by them. These days celebrities are very PR conscious, rightfully so. Most of those who are active on social media are from Bollywood.

Amongst politicians only Shashi Tharoor (http://twitter.com/shashitharoor) has notable presence on Twitter. MTV channel has over 100,000 Twitter followers, this shows that the youth is accepting social media as a medium of communication. IPL which has taken

India by storm has good presence on social media. Every IPL team seems to be updating their Twitter accounts promptly.

Leading editors of TV channels and newspapers are active on Twitter. Amongst corporate telecom companies, airlines have started providing basic customer support on Twitter. It is a good start but there to still a long way to go. I have tried tweeting to @airtelpresence, they responded once promptly, but the second time I was ignored. Corporates will need to use Twitter-CRM tools to attend to support requests on Twitter. They must not hesitate to spend on such paid tools.

Indian brands too can see mega success on Facebook fanpages, provided their fans see some benefits. Starbucks (http://www.facebook.com/Starbucks) is one of the best success stories, they have close to 20 million fans! Starbucks has received over 50,000 product ideas from social media. Dell generated $6.5 million in sales from Twitter in 2009. Leading US ISP, Comcast's CEO went on Twitter and they were able to help over 150,000 customers. We are yet to see such a success with Indian brands but things should pick up once they cleverly harness social media. With wireless broadband becoming a reality by end of 2012, we can expect social media traffic reaching the next level.

People tend to 'write off' proven platforms. For example, there is talk about 'email will die' because of Facebook. I doubt it. Such platforms will co-exist and change their shape and form over time.

Unlike the Western world, I believe we, in India, do not have easy access to quality information. For most things we rely on 'rumours' – power cuts, water cuts, exam timetable, government falling or forming, or anti-corruption news (but now we have Wikileaks and our own Radia Tapes!).

Ordinary citizens can find Twitter very useful if content is published from authorised sources. For example, it would help for motorists in every city to have a traffic update. There are situations when power cuts are inevitable (e.g. the power station is under maintenance), but the government does not feel it is necessary to keep the citizens informed. Official agencies should use the digital highway via social media and SMS to keep in touch with the citizens.

Sports (which means 'non-cricket' in India) is gaining traction. Many in India missed watching the live matches of badminton star Saina Nehwal during the Commonwealth Games (Delhi) & Hong Kong Open Series (December 2010). Reason: nobody published the timings and the TV channel information on which the game would be shown. Even the Badminton Association did not impart this information. They could have used the social media to spread such news.

Social media is bound to bring a lot of awareness, if not transparency, in India. People are talking about 2G scam very openly on Twitter. Since the Twitter user numbers are still small, these tweets are not loud enough to spoil the sleep of our politicians.

The Indian Language Internet: Challenges and Opportunities

Some of the key challenges we face are that language content faces a 'discovery problem' because search engines are English friendly. We continue to improve the quality of our content by which we have witnessed word of mouth marketing.

Before 2006, Unicode was not very popular. Customised fonts from C-DAC and Modular Infotech (Srilipi font) were working only on Windows but not on Macintoshes or mobile handsets. At Oneindia.in, we moved from Srilipi font to Unicode in 2007, and had to convert 7 years of data! It was a huge effort. TCS Hyderabad played a big role in providing open source scripts to do this conversion.

Once the usage of Unicode fonts increased, search engines were able to index Indian language sites. On search engines earlier we saw junk text, with Unicode we were excited to see readable text. A few Indian language (Indic) specific search engines did come up, but with search engine major Google focussing on Indic, I seriously doubt others have a bright chance to shine in the Indic search space.

The Indic space got another boost when Google News India (http://news.google.co.in) starting showcasing Indian language publishers. I was a little disappointed to see Kannada not being included on Google News - after all their Indic team sits in Bangalore! You often hear from people that Indic has not taken off on the Internet because there are not enough writing tools (eg. keyboards). There are basically two main concepts when it comes to Indic writing – transliteration and Inscript/language keyboard.

On Oneindia.in we started using Google transliteration editor to gather comments from our readers. It has been very successful, and we were very excited to see people commenting in their languages. It was safe to assume that those who were commenting were bilingual, i.e. they knew English and an Indian language. From the feedback emails we could infer that they were more comfortable writing in their mother tongue than English.

Earlier versions of online newspapers were image based, i.e. the print edition was scanned in parts and was uploaded. The site was heavy and bandwidth was limited - in spite of it these newspapers had a loyal user base. Now most newspapers are moving towards Unicode.

You not only find big media houses publishing in Indian languages, but also a sizable number of language bloggers who passionately blog. In fact you have language blog aggregators who find it viable to crawl these language blogs!

Advertisers were refusing to advertise on language sites till 2002-2003. We showed them the loyalty that language sites can have (as high as 75% return traffic) and slowly advertisers are beginning to believe the potential of Indian language sites. We demonstrated that banners with language creative gave better results (CTRs - Click-through Rates).

India has witnessed a higher penetration in the mobile space compared to the PC web. We made sure our content was available on for mobile Internet users (through oneindia.mobi) and SMS (through mytoday.com). Basically, we analysed how people are able to access our content and we went to them instead of expecting them to come to us.

Indian Languages on Mobile Handsets

We are guaranteed to see huge consumption of language content on mobile handsets. The main hurdle currently is the support of language fonts on mobile handsets. Only if the handset has built-in Indian language fonts can you read that particular language on that phone. A few vendors like Nokia and Lava have realised the potential of language content and started supporting Indian language fonts on their phones.

A company based in Bangalore, Eterno, saw the opportunity of supporting Indian languages on phones that do not have language font support and built a product called 'Newshunt' which allows literally over a thousand mobile handsets users to read Indian language content. Our own Oneindia.in content was launched on their mobile app in Sept 2010 and has seen a huge increase in its readership.

Indian language publishers are not able to make their content available by SMS, WAP & mobile apps because of the font issue. This will change in the coming years for sure.

Wikipedia

Wikipedia.org is one the most visited sites from India. Wikipedia is available in more than 20 Indian languages in India, of which only 8 are active. South Indian languages are the most active ones. Wiki meet-ups, workshops, exhibitions, seminars are regularly held across India to popularize language Wikis. Tamil wikimedians have conducted wiki workshops even outside of India (Canada, Europe). Malayalam wikimedians had released an offline version of selected wikipedia articles.

There are several Wiki projects: Wikisource, Wiktionary, Wikimedia Commons, Wikibooks, Wikiquote,Wikinews, Wikiversity. Each of these have Indian language versions, unfortunately very few Indians are aware of these projects.

For the period Jul-Sep 2010, India ranked at number 15 globally, in terms of Wikipedia page views and edits which is expected for having only 7% internet usage in the entire country, one of the lowest in the first 50 countries on the list. However, India is still the fifth largest viewer of the English Wikipedia. 94% of all Indian Wikimedians view the English Wikipedia; the second largest language group for India after English is Hindi, with 0.6% of total views. The viewing trends point at a steady rate of viewer-ship from India, registering at 93-95% of total view for the past year (2009 Jul-Sep).

In terms of popularity of Indian language Wikis, the ranking is Hindi, Telugu, Tamil, and Malayalam. The page views from India for Wiki could be very high because Google gives tremendous exposure to Wiki pages on Page 1 of its search results page.

The following table gives an idea about the number of articles in Indian languages in October 2010. English is way ahead of other languages, the main reason being that very few from India are actively contributing to Wikipedia.

The amount of Indian language content on Wikipedia is low. Hence the page views are low. Unless we contribute a lot of content we cannot expect the page views to increase. According to Alexa, Wikipedia.org is the 7th most popular site in India. According to Comscore reports (for Oct 2010), Wikipedia.org had 13.611 million unique users (men 8.9 million, female 4.9 million) and 160 million page views from India. The majority of the users who access Wikipedia are in the age group of 15-44. The age group 15-24 accounts for the most traffic to Wikipedia. These reports clearly show we are good at consuming but on the contributing side we may not be that active as yet.

The Broadband Experiance

The Internet in India is already stepping out if its dialup roots, and cable TV operators also began to offer Internet access in the late 1990s. Cable Internet gave a lot more speed compared to dialup access. People felt a lot more motivated to use the Internet.

Since 2005, broadband has been made available by private telcom players. This is much more stable and faster. As laptops become more affordable, data cards enabled people to use the internet when on the road too. And since 2008, mobile Internet on smart phones has gained momentum. There is a talk about mobile internet ‘replacing’ PC web. I disagree; both will co-exist and grow. The percentage of users who access the Internet on their phones will be high, but for serious rich-media browsing a big screen would be healthier.

If we rely just on wired broadband, India will not build a huge Internet user base anytime soon. Wireless broadband and 3G is the way. We have to make the Internet accessible in every part of India. We have to make PCs, software and tools a lot more affordable. These combined will make India a far more ‘connected’ country.

Once 3G becomes a lot more affordable and has a decent ‘mass’ user base, mobile apps could overtake SMS related services. While SMS marketing will stay and grow, apps related to news, financial services could become more popular mobile apps.

Language	Primary+Sec Speakers	Editors (5+ edits per month) per million speakers	Views per hour	Article count
English	1500 M	24	9,889,432	3,455,258
Hindi	550 M	0.1	6,543	61,055
Bengali	230 M	0.2	2,685	21,764
Punjabi	104 M	0.0	257	1,935
Marathi	90 M	0.3	3,353	32,102
Telugu	80 M	0.5	2,313	46,076
Tamil	66 M	1	3,726	25,804
Kannada	47 M	0.6	1,342	9,855
Gujarati	46 M	0.3	736	17,154
Malayalam	37 M	2	2,183	15,202

Looking Ahead: The Internet Horizon for India

One of India's strengths is the huge population that can potentially use the Internet, and can be comparable to China someday. As usage increases, there will be a lot more entrepreneurs entering the internet/mobile space. However, the government needs to become an enabler instead of a hurdle in the growth of Internet.

We could see many jobs being created because of the Internet in Tier-2 cities, as you need not physically be in a Tier-1 to run an Internet company. With mobile Internet becoming bigger, a lot more companies will emerge in this space. Transactional activity on the Internet will also increase a lot more

But if the Indian education system does not generate a lot more 'employable' graduates it will be difficult for the Indian Internet space to become a formidable one. Employability issue seems to plague this segment, just like the way it's currently plaguing India's IT industry.

Fortunately, the Indian government has started embracing the Internet. The Income Tax Department has done a great job in ensuring that almost all filing can be and should be done mandatorily online. There are many other departments that need to go online. Every department and utility services, which is directly related to the common man – power, water, property tax – must follow the Income Tax Department in making all transactions to be done mandatorily online. Indirectly, government will also be reducing pollution by allowing citizens to pay for these essential services online – none of us will have to travel on busy roads and stand in endless serpentine lines to pay the bills. Of course, it will be emirommentally friendly too as it not only cuts down on travel but also saves on paper.

We need to stop thinking that the Internet is only for English speaking citizens. According to some reports, a mere 12% of Indians are comfortable with English; the rest, which is the majority, want to communicate in their mother tongue. And a country like India has several mother tongues.

Lately, tablets like Apple's iPad and Android tablets from various vendors are getting popular. Thin clients with internet access like the one from Novatium will gain momentum in India because it is very cost effective. You do not have to invest in hardware and software and it would cost a mere Rs 500-600 a month to have Internet capable systems at home. By now such devices should have taken off.

In India, we need to encourage sharing success with others. I was talking to founders of a restaurant booking portal in 2008. Their product is very good and the main source of revenue is from ordering 'take home food' and table booking. The founders were telling me how hesitant restaurant owners were to work with this Internet portal. The restaurant owner's argument was, "Customers come to me on their own, why should I pay you to get more customers?" We need to change our attitude: grow and let others grow with you.

Product vs Service Companies

India is known for its IT industry as a services powerhouse, but we are not as well known for developing world class software products. One of the few that comes to my mind is Tally (Indian version of Quickbooks) which has done well. But products like FusionCharts.com are gaining momentum in the West too. We do not have too many product success stories from India, due to lack of huge funds and product managers. Also, we see more cash flow in the services industry which attracts entrepreneurs.

In 2010, we saw a few exits in the Internet space – Makemytrip.com (Nasdaq IPO), mergers in group buying space (grabbon & snapdeal, Wanamo & DealsAndYou), Carwale.com, HolidayIQ.com. In fact, Oneindia.in itself was acquired by Mumbai based Netcore (known for its SMS product MyToday.com)

Recommendations for a better Internet space in India

To crate a better Internet ecosystem in the country, the government should incentivise telecom companies to provide broadband in India. They need to be available in every part of India. Today the Silicon Valley of India, Bangalore, itself is not wired in every nook and corner of the city and this is shameful. Telecom companies complain that state governments do not allow them to dig the roads to provide broadband connections.

The government needs to do something about slashing the Internet rates in India – both for consumers and businesses. Many Indian portals are hosted outside India. The industry is eager to host their sites in India but the costs are prohibitive.

Most Internet ventures grow to the next level after they get some sort of funding. One of the main things a VC looks for while investing is scalability of a business. Internet ventures in India are as smart as their US counterparts but when it comes to numbers we are weak. Only if India has a far larger user base will things be a lot more different for us Internet entrepreneurs. Today, the estimated number of Internet users is about 70-80 million, it should have been in the range of 250 million. The only way to reach these levels is to have easier access to Internet, at "affordable rates". We hope the recently approved Wireless Broadband Policy will take us towards this goal very soon.

A country like Indonesia has better Internet penetration as compared to India. This is a serious issue as India's Internet industry can face serious competition from such small but vibrant countries. I have heard of VCs in India saying, "It is better we look at Indonesia instead".

India has done a reasonable job in introducing Internet and computers in the education system. But it would be good to improve the syllabus a lot more to arm our students for the real world. It should be emphasised that the Internet is not for the future software engineers only. Rather, the education system must show how Internet needs to be used in all fields: construction, medical, tourism, research.

The Internet industry in India will grow a lot faster if the advertising world also accepts this as a serious medium. Media planners need to include Internet properties more proactively. Except for the top 2-3 Internet properties, others have to hard sell themselves to be part of media plans.

The Internet industry on the other hand needs to think hard to solve the problems we have in our daily lives in India. We can't be always aping the West and build Internet companies as clones of Silicon Valley startups. We need to stop floating companies just for the sake of valuations and exits; that is not contributing much to Indian society.

The Internet in India: The Lighter Side!

- I have lost a few employees at the time of their marriages, the reason being the girl's parents did not want to give their girl to a boy who was working for a 'dot-com' company! A few good journalists well trained for the online world quit and joined the traditional print media just to have a 'normal' life! I have been in the Internet field for a long time and I think I have had a normal life
- With the usage of mobiles for data apps increasing exponentially, I believe VCs will find a lot more opportunities and good ROI by investing in the eye care industry: you see more and more young ones wearing spectacles!
- During the early days of mahesh.com, I used to start my day by checking my emails early in the morning. My daughter has been seeing me accessing emails from the time of birth. Usually you ask a family member at home in the morning "Have you brushed? Want coffee?". My daughter was around three years old when she once asked me as soon as she woke up: "Have you checked your email?" I was baffled by her question!

Resources

IMRB language on reports http://www.iamai.in/Upload/Research/vernacularreport_44.pdf
Twitter 8% penetration http://www.pewinternet.org/Reports/2010/Twitter-Update-2010/Findings.aspx
http://stats.wikimedia.org/EN/Sitemap.htm
http://stats.wikimedia.org/EN_India/Sitemap.htm

B G Mahesh was one of the pioneers in the Indian Internet space and has been active since 1992. His first online portal was Mahesh.com which became one of the most popular Indian portals during the early 1990s. Mahesh co-founded Indiainfo.com in the year 2000. Mahesh launched Oneindia.in and Click.in in the year 2006, with focus on Indian language and classifieds respectively, on the Internet and mobile. These portals were acquired by Mumbai based Netcore in April 2010. Mahesh did a major part of his schooling from Kendriya Vidyalaya, followed by National College Basavangudi, Bangalore. He received his undergraduate degree in Computer Science and Engineering from SJCE, Mysore and graduate degree in Computer Science from University of Alabama at Birmingham.

Chapter 8

Rajesh Jain

The Untold Story – IndiaWorld

Editor's Note

Tracing the birth, growth and acquisition of the IndiaWorld portal – the largest Internet deal in India's dotcom boom – this chapter traces the growth of the Internet as a global medium for Indians, starting off from its humble dialup roots in the early 1990s. From a single aggregation site to a number of vertical sites, IndiaWorld also expanded into providing Web and email solutions for Indian organisations. The most positive aspect of the dotcom boom is that it gave people a taste for entrepreneurship. The chapter contains several useful tips for entrepreneurs (e.g., it is important to know not just when to enter, but also when to exit!). Today, the startup scene in India's digital space is buzzing, thanks to social media and mobile phones. Though home-grown portals still face stiff competition from global players and mobile revenues are dominated by operators, there are opportunities emerging in "app" space and micropayments.

I have written this out as a compilation of blog posts written over the years to capture the spirit and context that existed at that time.

[Posted: December 1997] IndiaWorld was launched on March 13, 1995, and in the past two years, has grown to be India's largest and most heavily accessed family of websites, including IndiaLine. In a recent survey (as part of an opinion poll on the Most Important Indians of the 20th century), over half of the people named one of the IndiaWorld sites as their favorite website. The company, which created IndiaWorld, Ravi Database Consultants Pvt. Ltd., has also grown to be India's largest web service provider, managing over 125 websites . Here is a first-hand account of how IndiaWorld has grown to become India's premier website.

The IndiaWorld story begins in September, 1994. I was in the US, trying to figure out a good business to do in an area other than software exports. It was the time when the Internet and Web were just beginning to catch people's fancies. I spent a few weeks at a friend's place, browsing the web on a 14.4 Kbps dial-up modem with Netcom's Netcruiser account. The experience was absolutely amazing. It was quite evident then that the web as a medium would have a significant impact on how information was disseminated. The web offered a good business opportunity, attracted the NRIs with good intent, and then looked at offshoots in electronic commerce.

That was the vision of IndiaWorld: a bridge between Indians worldwide. To quote from our introductory document,

"Our mission is to create an electronic information services organisation, with a focus on emerging markets. IndiaWorld is the first step in this direction. We intend to leverage Internet as a global distribution medium, and build a platform for electronic publishing and commerce. In doing so, we hope to bridge the information gap and enable commerce initially between users in the developed economies and suppliers in the emerging markets, and later between the suppliers in the developed countries and users in the emerging markets. The changes which have brought India to the forefront of the world economy are momentous and irreversible. Interest in India is increasing and yet, information on India - its business, culture and people - is not easily available. The Internet is the distribution medium which makes possible rapid access to information, anytime and from anywhere. We are riding on this network, with a focus on digitized content on India. We see Indians (living inside and outside India) interconnected together, with each other and with business partners. IndiaWorld is the bridge. Geography is today increasingly becoming irrelevant in doing business. We are building upon the rich past of India, and the vibrant present, and looking forward to a connected future, connected via IndiaWorld".

On my return to India in November 1994, I wrote to various publishers and talked to a number of companies and individuals to participate in the venture by offering their content. It was tough explaining the Internet and the web to people in India then. There was no commercial Internet access provider (our 'shell' account was through NCST/ERNET). Most thought the Internet to be another variation of a satellite channel. I would take a notebook with NCSA Mosaic, and show them the power of hyperlinks. It wasn't quite clear how it would make an impact on businesses, but yes, it was going to transform how NRIs got their information.

Our focus was on IndiaWorld as a news and information service provider for NRIs. With help (and content) from Indian Express, India Today, Dataquest, Reader's Digest, Kensource, Crisil, CMIE, DSP Financial, Professional Management Group and Laxman, IndiaWorld was formally launched from a server in the US on March 13, 1995. Emails were sent out to friends, postings were made in newsgroups, and we anxiously waited for people to start accessing the site. As the emails started pouring in, we knew we were on a winning journey. One smart thing we had done was, to ensure, quite a lot of archived content. This way, when people came in, they had plenty to see. Imagine suddenly having 30 Laxman cartoons to browse! This way, we knew the people would keep coming back.

Two days after the launch, we covered the Union Budget live. We had a group of analysts and journalists, all watching the TV in one room and giving their comments. In another room, we'd type it all up and put on the website -- with a direct dial ISD call (since the ERNET US link

chose just that moment to go down!). The bill for 2 hours came to about Rs 8,000 (with umpteen number of disconnects). All said and done, once again, the feedback received convinced us that we had done the right thing.

While we were very keen to charge a subscription fee for sections of IndiaWorld (we started at USD 49, then dropped it to USD 29, then to USD 20 for a year, and then in November 1996 dropped it altogether). This was a flawed model and it probably helped drive some people away, but we saw it as an extremely useful service. In 18 months, IndiaWorld had about 5,000 subscribers. More interestingly, a figure three times larger accessed the front page and the headlines page.

In those initial days, IndiaWorld managed to grab the pulse of the people, managed to strike a chord with the masses. The word-of-mouth was extremely positive, and other than one ad in India Today International in May 1995, we had never advertised on any medium. If we could not make a business successful through the Web, there was no way we could help others to do the same.

The first few weeks of IndiaWorld taught us many things, which till today serve as the core principles on which IndiaWorld runs:

- Update Daily or more often: Ensure that you can get your audience every day. Many people worldwide begin their day by first checking out IndiaWorld.
- Cover prominent events live: Over the past 30 months, IndiaWorld has covered three budgets, the 96 elections and over 100 cricket matches live, besides a dozen Q&A sessions.
- Answer emails that come in promptly. Email is our only link to readers. We do try and reply to every message which comes in (we get over a hundred daily), and it is these messages which have served as the source of new ideas for us.

IndiaWorld concentrated heavily on content-aggregation, rather than creation. It has been our belief that it is difficult to compete with print-medium brand names on content. Without large investments, it is difficult to match their ability to create content. Also, the incremental cost for a print-medium provider to put its content on the web is marginal.

So, keeping in view that sooner or later, all the content providers are going to have a web presence, we looked at creating an all-in-one service on the Net: news, stock quotes, astrology, Laxman cartoons, news articles from India Today, etc. The focus was on building an Internet brand, which would attract people and give them all they need in one service. The big draw was the news headlines, which was updated twice daily, and the concomitant free email service.

For the first two years of its service, IndiaWorld generated almost 95 per cent of its traffic from outside India. We saw this changing in early 1997, as more and more Indians started getting on to the Net. It was then that our content aggregation and the all-in-one strategies underwent a change. We decided to (a) create specific non-news sites, targeting an audience within India also (we expected that by next year, more than half the access will be from people within India), and (b) actually create content in these specific areas. While IndiaWorld would remain the mother brand, popular sections would be broken out with their own identities.

As a result, starting with Khoj, the search engine, the IndiaWorld family now encompasses a total of nine sites - Khel (Cricket), Man Pasand (favourites), IndiaLine (Internet), Samachar (customised news), Dhan (personal finance), Bawarchi (food), Itihaas (History) and newsASIA, a Samachar-cousin, targeted towards the Asian region. Please note that I am writing in the present tense, taking myself back in time.

Samachar has been perhaps the biggest success in terms of the effort-performance scale. It runs automatically, creating the news links every 30 minutes, and its single page generates over 15,000 page views a day, increasing about 7-8 per cent a week. More importantly, it puts us in the News business, without having to hire any journalists.What also surprised us was the success of Bawarchi. Saroj's one-new-recipe-a-day gets over 7,500 page views a day.

What are our future plans? To continue building on the family of websites, and adding greater personalisation (today, there are only two personal SABLE sections: Stock Quotes and Samachar). In addition, we have also developed an advertising management system to allow for easy control and placement of ads across all the sites. Code named khojnet, it will be deployed early next year, and will offer us (and the advertisers) a real-time MIS on ads and click through.

When we began IndiaWorld in early 1995, we had little idea what we would be doing three years later. All we knew was that by being ahead, it would open up opportunities, which others would not be able to spot early, and that is exactly what happened.We were beginning to get noticed. IndiaWorld began by offering home pages and websites, the first Indian company to do so. Banks, finance, real estate and publishers were among the early clients. Setting up home pages did more than offering us a source of revenue. It got us in direct touch with the domestic market, and exposed us to requirements much earlier.

IndiaWorld has been able to downstream this advantage into multiple streams of business: advertising, custom software development, and most recently, messaging and communications, with the same clients.

What are some of the things we have learnt in the past three years? Setting up a business in India is non-trivial. There is little help from venture capitalists or from banks. Being small is almost a bane. So, it is very important for a business to be profitable at an early stage. Being acquired is not a long-term strategy (or for that matter, even a short-term one). One has to build it and be able to run it for quite some years to come. This environment makes it difficult for entrepreneurs. However, it also offers a corollary; since resources are always limited, it makes one think of optimisation of their usage, and on what one does. For a small business, there is no such thing as a small mistake.

Since we had little or no access to external funds, we had to ensure that each activity we took up was profitable; and true to our judgment over a period of time, this ensured a very good base for the business. The challenge, of course, is to ensure that short-term profit motives are balanced by long-term strategic decisions. In our case, the home pages business generated short-term revenues, while the investment in a network of websites offered a longer-term opportunity for building up page views to target advertisers.

In the Internet segment, it became quite evident early on, that the market will take time to grow. India was not going to grow from 0 to a million in a year, as we would have liked. In India, everything moves a little slow! But we also catered to a significant audience which was outside India. So, we had to keep up with the changes happening worldwide.

Technology plays an important role. We built our systems mostly from public domain technology - Linux and Apache. This minimised the starting cost, and also enabled us to implement projects rapidly. In our case, the time from start to finish for launching Khoj was 10 days and for Khel, it was three weeks. We found it easier to get support on Linux and Apache than on some porprietary products.

On needs to be almoste vangelical while marketing the Internet in India. Technology isn't hot in India, and the Net is still viewed more as a technology, than as a medium for communication, marketing and commerce. That is why marketing requires more than adequate knowledge of the

technological platforms. One needs to convince companies that this is the right approach. It's not as much as selling a product or service, as it is selling a vision - a vision of doing things differently, a vision of creating a business strategy.

The opportunities on the Internet are immense. It requires one to understand the fundamental changes which are being brought about by computers and communications. Being able to think through the impact the Internet will have on future business will open up significant opportunities for entrepreneurs and companies. Just think, your biggest competitor two years down the line may not even exist yet!

Jaunary 1998: IndiaWorld - The Future

Where does IndiaWorld go from here? It's a question we ponder on quite a lot. There is no right or wrong answer. Only time will tell. But being in the midst of it all, one develops insights which can be quite different from what someone on the outside sees. IndiaWorld began with content for NRI audiences, went into website development, and then created more sites for a growing domestic audience and an international audience, which wanted more than just news.

The wheel has come to a full circle now. The domestic audience is the key to the success of a web service, and that is something which few web masters seem to realise. Everyone tries to target the NRI audience. The numbers are there, but little else. Other than a handful of banks, finance companies and financially-constrained real estate companies, there isn't really anyone else for whom the NRI clientele matters much, and who are also willing to pay. Yes, the NRI audience gets hits on the site, but not money. We began with NRIs because they were the only ones who were out there. But we must not stop with them.

It is very important to create services which also interest the domestic Indian audience. This group does not want to go online to read newspapers and magazines, which they can buy for what they'd pay to read a story online (the difference being the payment is for telecom, and not content). And that is exactly what we have strived to create in the last 10 months. Expect more of this in 1998. In the US, one talks of audiences in terms of millions; in India it is still thousands. And that will not change easily because the telecom infrastructure will take time to improve. We don't want to build a business which is dependent on external growth constraints and policy

over which one has no control. We need to go to where the eyeballs are.

The eyeballs are on the corporate desktop. This is where a significant opportunity in India lies. India needs an information service delivered over a phone line to the corporate network and delivered on the desktop via the Web front-end. That's because corporate India, while being state-of-the-art on the LAN front, is 7-8 years behind on the WAN front. That's where the opportunity lies: Near-Real-Time Content Delivery on the desktop over a nationwide dial-up network. Use the Net for what it is: a distribution vehicle.

Another growth area is in Internet strategy and implementation. An Internet Business Strategy does not mean a website on the Net. It means envisioning the future. It means ensuring that email is present on every desktop in the organisation. It means everyone in the company can access the Internet for mission-critical website, and over dial-up (since leased lines are still way too expensive). It means integrating the external website with an Intranet and an Extranet, the former for employees, the latter for customers. It means extending the system for business-to-business commerce.

Developing Internet vision is perhaps the most challenging aspect. How will the Internet revolutionise your business? How would you do your business if you started now, with the Internet in place? This is where organisations need to think through their strategy from first principles, and perhaps, look at IndiaWorld's example. India's largest network of websites, reaches out to over 75,000 people via the web and an email service, generating 100,000+ page views daily, and arguably, is India's only profitable Internet venture. It did not exist three years ago! We didn't set out to do all this three years ago - some of it just happened. We began with a belief that if we are in the business and if we are close enough to our customers, the ideas will automatically come. And they did!

The Internet is not about technology, it is about being better informed, it is about communicating, it is about doing business. The Internet is about doing the things that you do everyday - better, faster, and without barriers, and in the process, perhaps radically change or create a new industry. That, for us at IndiaWorld, is the real essence of the Internet: the capability to translate ideas into action rapidly; the knowledge that we are making a difference to many thousands worldwide; the belief that we are at the forefront of what is perhaps the most important development of our generation; a conviction that battles of the future will not be decided by size or money, but by the ability to out-think the competition. Three years on, we feel we have just begun. And, we really had just begun.

November 1999: IndiaWorld is bought by Satyam Infoway

From the Indian Express:
Satyam to acquire IndiaWorld for Rs 499 cr

ENS ECONOMIC BUREAU
MUMBAI, NOV 29: In one of the largest deals in the Indian corporate sector, Internet firm, Satyam Infoway Ltd. said on Monday that it has bought a 24.5 per cent stake in IndiaWorld Communications Pvt. Ltd. for $28 million (around Rs 121.50 crore).
In addition, Satyam has also acquired an option to purchase the remaining 75.5 per cent of the outstanding shares of IndiaWorld at any time prior to June 30, 2000 for an exercise price of $87 million (Rs 377.50 crore).

Once Satyam buys out the entire 100 per cent stake, the acquisition will cost around Rs 499 crore (around $ 115 million), making it the largest takeover in the booming Indian Information Technology sector.

IndiaWorld website registered an aggregate of 13 million page views in October 1999, most of them coming from outside India, the statement said.

'The two-step cash transaction which would eventually result in the integration of India World's popular websites with Satyam Infoway's portal www.Satyamonline.com.'

IndiaWorld's websites, very popular with overseas Indians (NRIs) worldwide, include www.samachar.com (covering India related news), www.khel.com (dedicated to covering cricket), www.khoj.com (the premier Indian search engine), www.bawarchi.com (providing more than 3000 Indian recipes) and various other sites focusing on niche areas of interest to overseas Indians.
R Ramaraj, chief executive officer of Satyam Infoway, said that coupled with the kind of traffic that the IndiaWorld portal attracts, "We now have an overpowering presence with 26 million page views per month." Satyam is the largest private Internet Service Provider (ISP) and

claims a subscriber base of 100,000 people across 30 cities in the country.

Ramaraj said, ``IndiaWorld is a perfect fit for Satyam Infoway. Satyam Online is already a very popular portal in India with focus on purposeful browsing. In e-commerce the new joint venture with Bank of Madura is focused on providing financial services and e-commerce to Indian interest audience overseas.'' ``IndiaWorld with its dominant audience overseas would provide that perfect first to make Satyam the portal of choice for India,'' he said.

Satyam infoway's portal www.satyamonline.com, which includes several popular websites such as www.walletwatch.com, www.carstreet.com, www.carnaticmusic.com is focused on providing content and facilitating e-commerce services primarily to Indian residents in India.

The portal registered an aggregate of 13 million page views in October 1999, a substantial part coming from within India, making it one of the leading portal networks dedicated to serving the needs of Indians in India. ``The acquisition would be a good strategic fit to Satyam Infoway's portal business adding a large `overseas Indian audience' to the large India based audience that www.Satyamonline.com currently enjoys. The combined portal network is expected to be a mega portal for India interest audience in India and elsewhere,'' Ramaraj added.

IndiaWorld has been in the business for over five years now. The Managing Director, Rajesh Jain said "It has been a profitable business for the last three years." IndiaWorld reported a pre-tax profit of Rs 27 lakh on a turnover of Rs 1.3 crore during the last fiscal.

June 2005: Dotcom Nostalgia: Business World Story

Here is an excerpt from my blog of June 1995.

A few weeks ago, Radhika Dhawan from Business World came and interviewed me for a story they were doing on five years of the dotcom bust. The article was published this week. There are five first-person accounts (based on the interviews). Here is the introduction:

The Dotcom euphoria burst exactly five years ago in India. During the giddy days of the Net boom, hope, excitement, greed and world-changing ideas jostled with each other, and changed the lives of the participants of the Net economy forever. It was a time "when the world went a little bit mad". BW's Radhika Dhawan asked five people, who were in the thick of things then, of what they think of it all in hindsight.

Let us start with my first-person account as written by Radhika. The text with my photo in the article introduces me thus: "He is the original poster boy of the 'dotcom era', who struck it big by selling his portal to Sify for Rs 499 crore. As always, we found Rajesh Jain still believing that every idea must aim to change the world. Else, what's the point?"

With luck on his side
Rajesh Jain
CEO, Netcore Solutions

There is a book, Lucky or Smart?, by a man called Bo Peabody, who ran a company called Tripod. My answer is you have to be smart to be in a situation where you get lucky. A friend once gave me a piece of advice: more than knowing when to enter a business, it is also important to know when to exit a business. You can't begin a business with the objective of selling it one day. But if an offer comes along, you need to be smart about it.

I launched Indiaworld a week after Yahoo! was formally launched on 13 March 1995. With any new technology, we tend to overestimate what it can do in the short term and underestimate what it can do in the long term. But for anything to work, the ecosystem has to fall into place. Thomas Friedman in 'The World Is Flat' talks about the telecom boom and how some of the same mistakes were made there.

The second point I want to make is about entrepreneurs. You have to distinguish between those who go in there, motivated only by money, and those who go in to change the world. An entrepreneur has to have a little bit of the 'change the world' thing in him. If I have to get my passion across, I have to believe that what I am doing is the next big thing. If I don't believe in it then how will I convince others? So you have to paint that picture of tomorrow by believing in your today.

Looking back, I think the most positive aspect of the dotcom boom is that it gave people a flavour of entrepreneurship. People quit well-paying jobs to see what the other side is all about. I wish it had lasted a little longer. Then we would have had a lot of money invested in the Internet business in India. That's what has happened in China. At least four portals managed to raise $100 million-plus on the IPO offerings. So when the dotcom boom went bust, they had the cash to discover mobile and gaming businesses. Businesses and markets may vanish but these companies had the cash to morph into something different. From these situations emerge the next big ideas. That culture of entrepreneurship would have lasted if we had a lot more ideas. My focus has really been on how to use technology as a platform and as a tool for change.

How can we create solutions for the next billion people in emerging markets? We need disruptive innovations in such markets. For instance, how do you deliver education differently? You need to leapfrog in the delivery of services. How can we build technology-enabled solutions which can be used in India first? How can you envision tomorrow's world and go out and create it? Indiaworld was a vindication of that belief.

November 2006: Looking Back

It was in November 1994 that I made the decision to switch tracks from trying to build a software service company, to one which could create content and a marketplace for Indians globally on the Internet. My confidence was low, but I had little to lose. I had to pick up the pieces from a failed past and look ahead to the future. I saw in the Internet an opportunity to do something different. During those rough and tough months, I did not once think of giving up being an entrepreneur. It was that initial period which taught me that one has to be focused on the journey, not just the destination. Things rarely go according to plan, but that doesn't mean one stops dreaming and doing.

The IndiaWorld journey lasted five years. During that period, with help from my wife and a committed staff, we built up India's first and largest Internet portal. When I look back at those five years now, it was an amazing ride. We did a lot with limited resources. We made more right decisions than wrong ones. We were also lucky on numerous occasions. For small businesses, any decision can be fatal – and a bit of luck is needed to ensure that the scales tip on the right side. The learnings from the past definitely helped in the right decisions that I made.

There were two things which I did not succeed at during that period – raising external capital for growth, and building an organisation capable of scaling up. In November 1999, when I sold the business to Sify (then Satyam Infoway), we were 20 people with a revenue run rate of about Rs 5 crore ($1 million). It was an organisation still largely driven by me with limited delegation of authority. Getting in new people would have meant raising capital – the profits in the business were not enough to scale up. In fact, there is almost a chasm between the 'seed' stage of a business and a 'scaled business.' It requires capital and organisational bandwidth to cross the chasm. I did not succeed in doing that in IndiaWorld. It is a weakness that persists to this day – and one I can hopefully overcome going ahead.

In the end, when I made the decision to sell IndiaWorld in November 1999, it was not an easy one. I had not created the business with an intention to cash out. For five years, IndiaWorld was the only life I ever had. But as I spoke to a few close friends, two things become clear. In business, it is important to know not just when to enter, but also when to exit. Also, by nature, my strength lay in taking new ideas and building new businesses, rather than sustaining existing ones. With this in mind, I decided to sell. That was my first (and to date only) entrepreneurial success.

November 2009: IndiaWorld Sale: 10 Years On

As mentioned earlier, ten years ago, on November 29 1999, I sold my previous company, IndiaWorld, to Satyam Infoway. It was a defining moment for me. It was also not an easy decision to make. Six weeks before the sale actually happened, I was wondering how I would manage to raise venture capital for the business, given that many competitors were doing so. A deal for an investment had just fallen through.

Then, it all suddenly changed. I had not one but two extremely attractive offers to buy IndiaWorld. And in the space of just over a month, the deal with Satyam Infoway materialised. That's how life is sometimes! I had not built IndiaWorld to sell it one day. In fact, I ran the business as if I expected to run it for the rest of life. But there are times when one has to think not just from the heart, but also from the head.

Even today, I get questions on the valuation. I have a 2-part answer. First, there was another suitor for IndiaWorld, so it was a competitive bidding situation. Second, look at what happened to Sify stock the day the deal took place. It rose to about $700 million on the day after the announcement of the acquisition. In fact, the stock began a meteoric rise that saw Satyam Infoway's valuation touch almost $10 billion in the next few months as it did a follow-on stock offering on Nasdaq.

One has to put that era in context. It was a time when it was a race against time to build web businesses and money was available in plenty for first-movers. IndiaWorld was the leader in the Internet space in the Indian context and that is what helped us (and later, Satyam Infoway). Of course, starting in late 2000, there was a re-rating of everthing dotcom. And Satyam Infoway too experienced a downturn in its stock price, but it had raised enough capital to go about building its business through the next few years.

November 2010: Looking Ahead - Opportunities in India's Digital Space

Once again, the startup scene in India's digital space has started buzzing. The first time it happened was a decade ago. At that time, the users and usage were missing. The situation is a lot different now. Much has happened in the intervening decade.

The Internet user base in India has grown from practically nothing to about 60 million. They are doing more than just browsing. Transactions are a big driver this time around – the convenience of buying tickets (air, train, bus, movies), books and more, with the multitude of payment options is helping drive e-commerce.

Social Networking didn't exist a decade ago – Facebook is rapidly emerging as one of the most accessed websites in India. Video consumption on YouTube is also something that didn't exist a decade ago. And of course, the search for jobs, homes and spouses is another big activity. The Internet has become much more diverse than just mainstream portals.

Advertising on the Internet in India now accounts for about $200 million (Rs 900 crore), but a majority of that is monopolised by two companies, Google and Yahoo. That leaves a much smaller amount for homegrown portals.

There is a market that is a magnitude larger than Internet advertising in India – and even that barely existed a decade ago. Mobile VAS (value-added services) accounts for consumer spend of about US$ 2 billion (Rs. 9,000 crore) in India. With a user base that is also about 10X the Internet base in India, India is one of the few "mobile first, PC second" markets in the world.

These are the two big digital opportunities – advertising and transactions. In the first case, businesses pay to reach audiences. In the second case, consumers spend money. Margins vary – based on whether it is a ticket that is being paid for, or a mobile game that is being downloaded. Both these markets have challenges going ahead. And therein lies the new set of opportunities. To make money via advertising, the Internet opportunity is about 10 times the mobile opportunity today in India. But the challenge is that the bulk of the money in this space goes to Google and Yahoo (with Facebook likely to be a strong contender in the future). That leaves a much smaller quantum for the local Indian companies.

In addition, the cost of selling Internet advertising is also high – should one choose not to rely on the ad networks (Google AdSense, for example). Ad Networks provide the lowest monetisation for a portal, so over time, there is little option but to build one's own sales team. And that is an expensive proposition.

In the mobile space, the operator is the enabler for almost all of the MVAS revenue, and as much keeps the lion's share of what end users pay. Again, this leaves much less money on the table for the content and service providers than what they would like – and what they need to build large businesses.

Is there a way out?

One clear opportunity in India is in the e-commerce space. As the Internet user base grows, the convenience of shopping from one's home (or office) combined with attractive deals will grow the market. The key determinant for success for hard goods will be the efficiency of the value chain (logistics of speedy delivery). Winners are already starting to emerge in the space, but these are still early days.

The second opportunity will emerge in the mobile data space. With the combination of high speed networks (3G), smartphones with high-resolution displays in the US$ 100-200 space (watch for Android to make a big impact in the coming months) and nearly-flat-priced data plans (Rs. 100 per month for almost unlimited usage), the mobile data space is going to see rapid growth in the coming years.

One obvious monetisation approach is advertising. But, the bigger opportunity will come from consumer micropayments. What is needed is a revenue share model akin to the App Store – where 70 per cent of what end users pay goes to the application developer. In India, the figure for VAS is much less than half of this, on average. This is what needs to change to create an innovation cycle that can drive a new billion-dollar market.

What is needed is the equivalent of an i-mode for India. While i-mode's 91 per cent payouts made Japan the pioneer in mobile data, my belief is that a model wherein content and service providers could get 70 per cent of the end-user payment can help drive data services in India. While App Stores do offer that, the "app market" in India is still quite limited. The challenge for App Stores is collecting money.

Here, then are the parameters of the problem that need to be solved:

- Collect money in small tranches (say, Rs. 150, or US$ 3) independent of the mobile operator for a collection cost of no more than 10 per cent. This problem is not as simple as it sounds – most Indians do not have credit cards, don't use their debit cards, and some many not even have a bank account. The lowest common denominator they all have is cash. What is needed is akin to a "cash conveyor belt."
- Pay out 70 per cent of the end-user price to the publishers (content and software)
- Run a profitable business with a gross margin of 18 per cent (20 per cent less 2 per cent service tax)

The opportunity in India is to target 100 million users who are willing to pay Rs. 50-100 (US$ 1-2) per month for mobile data services. No one other than the mobile operator has solved the problem of collecting and billing for small amounts of money. India needs an alternative micropayments and publishing platform to help drive the mobile data ecosystem. Therein lies the biggest set of opportunities for intermediaries, content providers and software developers.

Rajesh Jain is Founder-Chairman and Managing Director of NetCore Solutions, a messaging and mobile data services company based in Mumbai. Netcore's SMS service, MyToday, launched India's first direct-to-consumer SMS super-store. In 2008, Netcore was awarded the Mobile Innovation Award at 3GSM in Barcelona. In May 2010, NetCore acquired Greynium, which runs OneIndia, India's largest portfolio of local language Internet portals. Rajesh is also founder–chairman of Emergic Venture Capital, which has invested over $20 into a dozen companies such as Novatium, Rajshri Media, and mChek. One of Rajesh's early ventures, India World Communications, which was launched in 1995, grew to be one of the largest collection of India-centric websites. IndiaWorld was acquired by Satyam Infoway in 1999 for US$ 115 million in one of Asia's largest Internet deals. Rajesh holds a B.Tech. degree in Electrical Engineering from the IIT-Bombay, as well as a n M.S. in Electrical Engineering from Columbia University. Being an avid blogger, Rajesh blogs daily at http://emergic.org .

Part III

Internet Impacts

Chapter 9

D.K. Jain

e-Panchayat

Digital Networks for Government Efficiency

Editor's Note

This chapter outlines the key role ICTs can play in enhancing Panchayati Raj Institutions in India (PRIs). PRIs function at the village, intermediate (block) and district level. 250,000 Panchayats form the core of the governance structure in rural India. PRIs play a major role in implementing the flagship MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme). Citizen participation in PRIs would be more meaningful if people had timely access to information. Key PRI applications include local government directory, funds monitoring, grievance redressal, social audit, GIS, citizen services and Panchayat portals. Broadband is not only a prerequisite but also forms the backbone of this project. One of the biggest constraints in broadband penetration is the lack of right applications and services oriented content. Topologies like wireless mesh are proving successful in some areas. The real success of this country lies in the hands of Panchayat – there are 31,00,000 representatives, each one of them has to be turned into a digital avatar.

The primary role of technology is to help ease the work of people, so it is somewhat disconcerting to know that majority of citizens of our country are scarcely acquainted with even basic technological innovations. As much as 70% of India's population resides in villages, and while the mobile phone revolution may see greater numbers getting connected, there is still a huge chasm to be bridged when it comes to computer and IT literacy. From the standpoint of governance, too, one of the long standing debates has centred on how best to reach and involve the largest number in democratic governance.

In India, this is sought to be achieved through the Panchayati Raj Institutions (PRIs), enabled by the Constitution (73rd Amendment) Act passed by the Indian Parliament in 1992. Thus, PRIs function at the village, intermediate (block) and district level and this concept of local self-governance promotes decentralisation by ensuring participation of the ordinary public in its own governance. These 250,000 Panchayats form the core of the governance structure in rural India, and are the foundational nodes of information collection, dissemination and the service delivery points for government administration. At the same time, they are located in the cusp of government and community. At the village Panchayat level, for instance, the sharp duality between the system and the citizen breaks down, as the Panchayat is essentially a body constituted from amongst the villagers themselves. Therefore, at that level, there is a far more direct interface between the citizen and the institutions of governance.

There are approximately 2,38,000 Gram Panchayats at the village level, 6,317 Intermediate Panchayats at the block level and 580 Zilla Panchayats at the district level. There are more than 31,00,000 elected representatives at all three tiers, with women representatives numbering more than 40%. Clearly, the Panchayats are the best way to reach out to the vast number of people. Using this premise, most government ministries and departments have restructured their core developmental programmes and schemes to factor in the Panchayats.

Indeed, the successful implementation of the various social sector schemes and programmes of the Central and State Governments at the grassroots level is inextricably tied to the Panchayats. A case in point is the flagship MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme) programme designed to ensure livelihood security to rural households. Panchayats are the principal authorities for planning and implementation of the scheme and are required to provide the requisite resources for capturing data and information about job cards, allocation of works, work measurement and payments to the beneficiaries.

Most of the schemes and programmes of the Government of India focus on alleviating poverty, providing employment, health services and basic education to all sections of society. However, while these may be conceptually well designed, there are numerous problems in the delivery structure leading to sub-optimal utilisation of scarce resources. For improving the outcome of the interventions, the stakeholders need to be empowered through access to information and knowledge, awareness of rights and the ability to question the system for inefficient delivery. In this age where knowledge is power, access to information will be the fundamental pillar of the new governance paradigm and to change power equations that are built on denial of information. This change in the governance paradigm at the Panchayat level can be realised by harnessing ICT. Citizen participation in PRIs would be more meaningful if people have timely access to information required to make choices and they are able to participate in decision-making processes based on facts, not rumours and half truths.

Importance of ICT-enabled Panchayati Raj Institutions

The first phase of ICT-enabled governance units ushered in the form of DISNIC (District Information System of National Informatics Centre) in 1985, which led to provision of some ICT tools, mostly hardware, and professionals at the district level. Some software applications geared towards specific requirements were also developed at the time. However, these were largely confined to monitoring of Rural Development Programmes. Also, there were no concerted efforts by the Central Government to spread usage of IT below the district level. As a result, the impact of these initiatives on building an ICT culture in the governance structure was marginal and stagnated for almost a decade.

The next stage of change came indirectly, as a result of a broader intellectual pool of talent being injected into the bureaucracy, with the introduction of engineering subjects in the UPSC examination from 1978. Many of these new officials were in touch with global technological changes and some also had degrees in medicine and management. As most of them had jurisdiction at the district level, they revitalised the earlier efforts and initiated use of ICT for public service delivery, for monitoring implementation of schemes, and so on.

However, these remained as largely isolated efforts which could not be scaled up without a state-supported enabling system. Gyandoot is an example that comes to mind as it became a hot topic of discussion in governance because of its success. But now, Gyandoot is history; its website is dated, its intranet based services are no longer available. Gyandoot was an intranet-based information portal developed in Dhar District of Madhya Pradesh, that offered a wide range of services, such as disseminating agricultural prices, information on government programmes, registration of applications and the likes. Although it is evident that Gyandoot centres were of immense utility to the rural population, in the absence of appropriate support from the State, the architect of the project relied largely on a revenue-based business model which came in the way of scaling up to realise its full potential. Though the central government and other organizations recognised the value of these efforts, beyond instituting awards for the initiatives (such as the National e-Governance awards), little was done to take the work forward and scale them up to the National level with adequate State support.

Like in the case of IT-enabled governance described above, many experiments in India seem to have succeeded in smaller pockets and clusters of villages. These experiments were concerned with improvements in micro-level planning, improved management of poverty alleviation programmes, innovative use of ICTs and the work of some Non Governmental organizations (NGOs) in building networks of self-help groups amongst the rural poor. Most of the initiatives succeeded because of grassroots level intervention. However, scaling up these successes to cover a large country like India has been the biggest challenge.

Another aspect of this story is that while local governance through PRIs is an excellent concept, it has not been free of problems in implementation. PRIs have been criticised for partisan approach and mismanagement of funds. At the same time, responsibilities disproportionate to their capacities, technical capabilities and resources are being assigned to them. This has severely raised questions about the usefulness of PRIs as the preferred delivery channel for the Central and State level schemes, as well as for citizen services.

It is here that the new initiative by the Central Ministry of Panchayati Raj signals a change. PRIs offer India's villages an opportunity to participate in the planning processes, to engage with the various developmental schemes being implemented by the Government and to interact with their elected representatives directly, to ensure that their interests are being effectively served and the funds that rightly belong to them are properly spent.

Computerisation and IT enablement of government functioning has received a high impetus with the implementation of the National e-Governance Programme, with most States also recognising its utility. This has led to a concerted thrust towards computerising the functioning of the state line departments in most states. The result of this is cognisable and has brought in its wake a significant increase in efficiency of departmental functioning. With increased online presence of the government and greater efforts to reach out to the population, it is only logical that the Panchayats too must be made a part of this change.

The Ministry of Panchayati Raj is not immune to such developments and has decided to take up computerisation of PRIs on a mission-mode basis. This initiative poses unique challenges, as the scale of the programme is in itself unprecedented, perhaps even if compared globally. The geographic and demographic coverage of the programme, therefore, makes it a challenging initiative to roll out.

ICTs in Panchayats

It is popularly believed that ICTs have played no role in Panchayat, especially at the institutional level. But the reality is surprisingly positive and promising. Out of quarter of a million Panchayats, at least 50,000 have gone ahead and used some allocated fund to buy computers although it is yet to be found as to what they are using them for. Yet, the present status of availability of computers at the Panchayat level gives a snapshot of e-Governance at the Panchayat level.

From this table it can be seen that as many as 15 States/ Union Territories viz: Andaman and Nicobar Islands, Assam, Daman & Diu, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala, Lakshdweep, Manipur, Orissa, Puducherry, Sikkim, Tamil Nadu and West Bengal have provided computers up to the Gram Panchayat level. Of these, states that embarked on the path of computerisation earlier, i.e. West Bengal and Kerala, have succeeded in introducing some citizen service delivery using ICT. This is evident from the various applications developed and implemented by them for citizen service delivery. They have developed their own application software and successfully computerised both the front end and the backend for some citizen services, such as certificates.

Table 1

S.No	State Name	No. of Offices	No. of ZP having computers	No. of Offices having computers	No. of BP having computers	No. of Offices having computers	No. of GP having computers
1	A & N Islands	2	2	7	7	69	67
2	Andhra Pradesh	22	22	1097	1097	21809	0
3	Arunanchal	16	16	161	0	1779	0
4	Assam	21	21	185	185	2202	2202
5	Bihar	38	0	531	0	8463	0
6	Chattisgarh	18	16	146	146	9734	0
7	Daman & Diu	2	2	NA	NA	14	14
8	Goa	2	2	NA	NA	189	189
9	Gujarat	26	26	224	224	13693	13693
10	Haryana	21	21	119	119	6083	120
11	Himachal Pradesh	12	12	75	75	3243	3243
12	Jammu & Kashmir	22	0	143	0	4139	0
13	Jharkhand	24	0	212	0	4559	0
14	Karnataka	29	29	176	176	5628	5628
15	Kerala	14	14	152	152	999	999
16	Lakshadweep	1	1	NA	NA	10	10
17	Madhya Pradesh	50	50	313	313	23012	0
18	Maharashtra	33	33	351	351	27920	1589
19	Manipur	4	4	NA	NA	165	165
20	Orissa	30	30	314	314	6234	6234
21	Puducherry			10	10	98	98
22	Punjab	20	20	142	142	12800	0
23	Rajasthan	33	32	249	237	9177	2995
24	Sikkim	4	4	NA	NA	163	163
25	Tamil Nadu	31	30	385	385	12618	12618
26	Tripura	4	4	58	30	1038	100
27	Uttar Pradesh	72	0	821	0	51914	0
28	Uttarakhand	13	13	95	95	7541	0
29	West Bengal	18	18	333	333	3351	3351
	Total	582	422	6299	4391	238644	53478

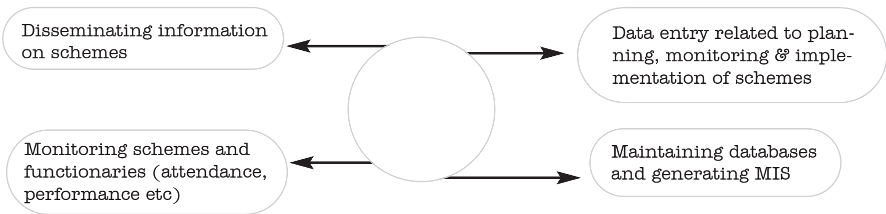
(Status as on 31/3/2010) (Source: Ministry of Panchayati Raj website: panchayat.gov.in)

States that computerised GPs more recently, viz. Tamil Nadu, Karnataka, Gujarat, Orissa, Himachal Pradesh, Assam, Manipur, Sikkim, are using installed facilities mostly for MIS of Centrally sponsored schemes and lag behind in development and deployment of software applications for citizen service delivery. This data also highlights variations in the level of readiness of States to harness the use of ICT for various public service delivery options. In view of this, it also becomes necessary to factor in this aspect in preparing a roadmap for ICT-enablement of Panchayats in the country.

Information and Service Needs Assessment

The Panchayati Raj structure in the country and the subjects that have been devolved to these institutions varies substantially across the country. Due to these variations, the needs and expectations of citizens from PRIs vary significantly. To capture these, Ministry of Panchayati Raj commissioned a comprehensive study following a detailed methodology for collecting and identifying requirements of various stakeholders including citizens & government line departments in 114 Panchayats in 38 districts of 27 states. Based on the findings of the study, the roles for Panchayats can be grouped as under:

In a process based framework, the roles and functioning could be categorised as: Citizen Information/ Service Delivery processes; Core processes of Panchayats; and Support processes. Considering these, recommendations are based on significantly diverse surveys and analyses, the PRI decided to have conceptualised appropriate applications and about 12 diverse applications are under development to capture the entire gamut of functioning of the Panchayat, its cabinet and its subjects. The applications are detailed in Table 2.



(Source: National ISNA study: Ministry of Panchayati Raj)

Critical factors for successful realisation of potential of ICT via Panchayats

Although an essential input in ICT-enablement of Panchayats would be provisioning hardware, it is also the easiest task to do. Developing relevant software applications is also not a technology challenge. Going by the past experience of e-governance projects, the biggest challenges are availability of truly high capacity broadband connectivity; serious lack of capacity at the village and Panchayat level, and of course the traditional mindset not willing to shift from status quo.

Broadband is not only a prerequisite but also forms the backbone of this project. Panchayats connected to the Internet will enable unprecedented flow of useful information to the citizens and vice versa. The importance of this has been realised by the government, which is evident from the address of the Hon'ble President of India. So far, most of the Panchayats have relied on connectivity provided by BSNL (Bharat Sanchar Nigam Limited). But there

Table 2

	Application	Description
1	Local Government Directory	Would provide unique codes to all Panchayats; Capture changes to Panchayats owing to delimitation and assign codes appropriately; It would link all Core Common Applications by providing a mechanism for identification of all Panchayats.
2	Panchayat Profiler	Would maintain a complete village profile encompassing socio-economic data, socio-demographic data, public Infrastructure and services, geographical boundaries of Panchayats.
3	Asset Directory	Would help in management of information related to assets and utilities created and maintained by Panchayats.
4	PlanPlus	Would help in preparation of district plans starting from grassroots, enable convergence of funds from different programmes / schemes to ensure effective utilisation of funds, track fund inflows and outflows and maintain sources of funding; Would enable preparation of Panchayat-wise Perspective Plan, Draft Plan, Action Plan and head-wise estimates of the budget.
5	PRIASoft	Would capture details of receipts and expenditure, automatically generate cash book, registers, Utilisation Certificate for many schemes; Will enable generation of all required registers by just a few basic entries.
6	ActionSoft	Would be used for Scheme implementation and monitoring; Would allow Panchayats to enter the implementation status of each scheme on the basis of the defined monitoring parameters; Would be usable for all Central / State schemes as well as the local Panchayat schemes, if any.
7	Grievance Redressal	Would be a generic grievance redressal system allowing citizens to lodge complaints against Panchayat functionaries and report any malpractices; Would track the entire grievance redressal process until closure.
8	Social Audit	Would capture all events and details relating to social audit conducted by Gram Sabha, the action taken report, and so on.
9	Training Management	Would be a portal providing details of all training programs, i.e. schedule, training material, etc.; Panchayat functionaries will be able to register for courses online. Also, the partner training agencies will be able to register.
10	GIS	Would display the maps of Panchayats and integrate with the other applications for Panchayats such as Panchayat Profiler, Planning & Budgeting, and Asset Directory, so that a spatial view of the profile / plan of a Panchayat can be obtained by overlaying various non-spatial data.
11	Panchayat Portals	Would generate a website for each Panchayat across the country; Would integrate with the other software applications for Panchayats to act as a single delivery gateway using single sign-on.
12	ServicePlus	Would be a generic citizen service delivery application to capture all events and information related to delivery of services to citizens by Panchayats.

are also examples of Panchayats using private service providers for connectivity, and some Panchayats have tried integrating their functions into some other existing schemes to create a culture of ICT and knowledge. For example, Gujarat has connected all its Gram Panchayats using VSAT, provided by a private operator, and all the Gram Panchayats are functioning as point of delivery for government related citizen services under the Central Government Pan-India program called CSC (Common Service Center). Another example is that of West Bengal, where too, the CSCs are located in the premise of Gram Sabha, with their active involvement.

Although the definition of broadband in India is that we should have minimum bandwidth of 256 kbps but considering the practicality of this speed, perhaps nothing useful can get done at this speed. Yet, ironically, we never get the promised minimum speed also. However, unlike the popular belief, more than 97,000 of the Gram Panchayats are covered with the availability of broadband infrastructure, and further 110,000 are planned to be covered soon. The latest data of broadband coverage of village Panchayats by BSNL is given in Table 3.

Table 3

			Village Panchayats covered through broadband			Planned through Broadband		
S. No	Circle	Total VPs*	ADSL	Wi-Max	Total Covered	ADSL	Wi-Max	Total Planned
1	Andaman & Nicobar	67	56	0	56	0	0	0
2	Andhra Pradesh	21862	10917	2349	13266	0	5121	5121
3	Assam	3943	710	295	1005	0	2289	2289
4	Bihar	8460	1730	534	2264	72	7246	7318
5	Chhattisgarh	9837	1493	252	1745	326	3067	3393
7	Gujarat	14439	7014	585	7599	0	2302	2302
8	Haryana	6234	4103	1139	5242	0	2384	2384
9	Himachal Pradesh	3241	1551	109	1660	734	1277	2011
10	Jammu & Kashmir	4146	642	0	642	6	2077	2083
11	Jharkhand	4559	321	640	961	0	4487	4487
12	Karnataka	5657	3256	167	3423	109	757	866
13	Kerala	999	989	0	989	0	0	0
14	Kerala-Lakshdweep	10	5	0	5	1	0	1
15	Madhya Pradesh	23022	2636	1521	4157	291	12702	12993
16	Maharashtra	28078	9366	780	10146	0	5964	5964
17	NE-I –Tripura	1040	160		854	0	1342	1348
18	NE-I-Mizoram	768	175	694	175	6		
19	NE-I-Meghalaya	1463	43		43	0		
20	NE-II-Arunachal Pradesh	1756	70		336	0	582	582
21	NE-II-Manipur	3011	60	266	60	0		
22	NE-II-Nagaland	1110	982		982	0		
23	Orissa	6233	1379	711	2090	0	2633	2633
24	Punjab	12809	9704	689	10393	82	1537	1619
25	Chandigarh	17	16	0	16	0	0	0
26	Rajasthan	9200	2424	522	2946	0	5946	5946
27	Tamil Nadu	12617	7450	320	7770	0	2305	2305
28	TN-Puducherry	98	98	0	98	0	0	0
29	UP (East)	37607	7913	1168	9081	0	29694	29694
30	UP (West)	14518	2585	3149	5734	0	11854	11854
31	Uttarakhand	7546	1698	303	2001	0	1277	1277
32	West Bengal	3354	1295	292	1587	211	2006	2217
33	WB-Sikkim	163	66	0	66	5	0	5
	Total	247864	80907	16485	97392	1843	108849	110692

(As on 30/9//2010) (Source: Report of Department of Telecommunication) includes equivalent rural local bodies in the VIth Scheduled Areas Address to the Joint Session of Parliament (4th June, 2009)

Capacity, access & content

The major issue in broadband Internet is providing last mile connectivity due to geographic, demographic and economic constraints. In rural areas, the populace is generally of poor economic background and cannot afford the diverse usage of Internet connectivity, thereby threatening the economic viability of providing the connectivity for a single connection at the GP level. This can be gauged from the fact that out of 9 million broadband subscribers at the end of April, 2010, only 6% are in rural areas. One of the biggest constraints in broadband penetration is the lack of right applications and services oriented content, and the little that may be available requires a certain level of literacy and education. Considering that India is an oral country, it is imperative to understand that unless there is a plethora of information, services, entertainment, and content available in audio-visual medium, there is little that we can expect of rural broadband penetration.

It is also important for the telecom infrastructure to not to wait for the OFC to be laid out, and rather go for last mile connectivity through Wireless, WiMax, and Wireless Mesh Network. It has been proved that the cheapest among them is Wireless Mesh and it works through difficult terrains also – per node connectivity cost for Wireless Mesh is less than half of the other options. A successful example of Wireless Mesh is in Dharamsala, Himachal Pradesh which has been connected by AirJaldi. The mesh backbone in Dharamsala has installed more than 30 nodes, connecting at least 2000 computers, providing upstream bandwidth of up to 6 Mbps across 50-70 kilometers. That is something we can learn from and attempt make commercially viable by making all the local institutions avail the services.

It has been learnt that many applications can be developed, but generating local content is the biggest challenge. We have had the content management system available at Panchayati Raj website for many years, but almost none of the Panchayats have availed the provision to upload content there. All one can find is PDF files of sanctions, surveys, reports, plans, and so on. Another factor that impedes the spread of e-Governance at the GP level is the lack of trained manpower for accessing applications. This is again directly related to literacy (including computer literacy). States such as Kerala have been able to march forward because of the availability of literate human resources who were able to adapt to the ICT culture easily. No wonder, in India, Kerala is the only example where we have web portals available in local languages – created, maintained and managed by the officers of the Panchayat. Other few examples are from civil society organizations, who have piloted with Panchayat in terms of training them, creating their websites and managing them with the help of local Panchayat.

Given the large numbers of functionaries and elected representatives to be trained, the task of ICT-enabling the Panchayat cannot be fulfilled through Government initiatives alone. This problem would need to be addressed in a campaign mode which could be similar to Teach for India campaign with necessary adaptation. For this, it would be necessary to pool resources from technical universities (students as trainers and the computer labs of colleges), the CSOs and the industry. Government should facilitate this initiative by providing requisite financial and managerial support.

Conclusion

In the last half decade, the Government has been able to take various steps to adopt ICT in governance outreach to citizens. Not all the programs are bottom up; in fact all of them are top down. Apparently, Panchayat Raj Institution are the only government bodies which are truly bottom up. Panchayat roles are enormous but real time delivery of work is largely decimal. Considering that the Panchayats represent the entire eco-system of rural India, they also have on an average 12-13 elected members per Panchayats, which is a huge number of leaders who bring prosperity to the lives of Panchayat. It is also quite clear that all the government services and schemes are largely believed to be implemented by Panchayat. Yet, visit any Panchayat and we see them incompetent, politicking, underdeveloped, often impoverished, and there would be complete bankruptcy of information and knowledge creation. The real success of this country lies in the hands of Panchayat – there are 31,00,000 representatives for about 250,000 Panchayats – each one of them has to be turned into digital avatar, leader of the future, and epitome of an information disseminator. Only then , can we think of bottom-up development empowering the masses.

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Chapter 10

Ashis Sanyal

Internet in India

Converting the Digital Divide into a Digital Opportunity

Editor's Note

This chapter argues how Internet, which is a stupendous derivative of ICT, can be an effective enabler for the development paradigm. Various contexts have been put forward to elaborate on use of Internet, as perceived by the Government, to improve the governance by online citizen-service delivery, by providing information to public through official websites, government policies and actions, processes and outcomes, utilization of funds etc for better transparency and credibility of government. It is observed that government has taken seriously the study report that every 10 per cent growth in tele-density would lead to an increase of at least 1 per cent in the GDP and in that process Government of India has embarked upon an over-arching, ambitious National e-Governance Plan which is expected to change the paradigm of governance, basically by the strength of ubiquitous Internet. Many success stories like MCA 21 in the Ministry of Corporate Affairs, Common Services Scheme of Department of IT, e-Seva in Andhra Pradesh, FRIENDS in Kerala, MP Online in Madhya Pradesh and e-Mitra in Rajasthan have been described which used Internet abundantly.

The Internet has been one of the most talked-about technologies in recent years. Since starting off as a US government sponsored project in the late 1960s to the invention of World Wide Web by Tim Berners-Lee and Robert Cailliau in 1989, Internet technology did not ever look back. In the recent years, convergence in Internet technology has made very significant migration possible for voice telephony and television to the Internet Protocol, which opens up a myriad of applications and value added services for the Internet users.

They said the Internet would change the world. And they are now watching from the sidelines as the Internet itself gets transformed! Web 2.0 has facilitated outstanding websites like Wikipedia, Flickr, Facebook and Picasa, which are being used extensively by netizens. By facilitating technology in promotion of various forms of human communication and creativity, it appears that the Internet has now become as much of social as a technological phenomenon. New forms of online interaction have transformed traditional forms of communication and spawned cyber communities.

The Digital Divide

Any technology is not inherently neutral. History would endorse that many technologies did empower individuals, groups or nations, while others were not so lucky to embrace them. While the Internet had progressed exponentially in various parts of the world, especially in the developed world, society's basket of divides - economic, social, cultural, ethnic divides – has now expanded with the newly coined 'digital divide.' The expression of the 'digital divide' was specifically in the context of availability of Internet access, or the absence of it. Digital Divide, as an addendum to all prevalent Divides in the Society, therefore prevents different parts of the world from enjoying the myriad benefits of the Internet technology. It is evident that connectivity, with appropriate bandwidth capacity in the backbone, needs to be established to provide a satisfactory user experience of Internet to individuals and institutions to be out of the digital divide.

Such infrastructure for Internet requires substantial upfront investment. It is therefore not a surprising fact that the Internet has proliferated around the world in a skewed manner. Internet proliferation has a strong bearing not only on the development of necessary telecommunication infrastructure, but also on the development of various standards and applications and some specific legal framework.

Furthermore, in the last few years, there has been continuous focus on political angles as well, with administrations and well-meaning world citizens getting increasingly concerned about protection of socio-cultural and national interests. Technologically Internet is a `network of networks'. However, in various parts of the world, these networks have not been established as yet. Consequently, there is a divide and significant parts of the world are yet to assimilate the innumerable benefits of this unparalleled technology. Further, it is interesting to note that while this so-called digital divide exists between the nations, it is prevalent between the localities within a nation, and also between the individuals or households within localities.

E-government in India

In the last few decades, there is a growing exploration of the potential of information and communication technology (ICT) in developing countries to use it as an effective enabler for development paradigm. The governments, industry and common citizens, all appear to endorse the view that ICT can provide huge economic and other opportunities to bring in significantly better quality of life. ICT and Internet have opened up new modalities for providing smart, reliable and responsive governance to the citizens. There is a definite bearing of the growth of telecom infrastructure on the growth of GDP of a country. Emerging e.government eco-system has exhibited the possibilities of greater integrity and probity in public service. There exist diligently researched and widely publicized findings that growth of GDP in a country is strongly affected by growth of telecommunication connectivity along with broadband Internet penetration. It is said that every 10 per cent growth in teledensity would lead to at least 1 per cent increase in the GDP.

With the advent of e-commerce in the 1990s, which has been aggressively promoting businesses including financial transactions, governments worldwide soon became attentive and serious about the possibilities of applying Internet and related ICTs for governance activities. Consequently, the discipline of Administrative Sciences has accommodated one new entrant named `electronic government' and more broadly, `electronic governance' in its fold. By definition `electronic government' or e-government indicates use of Internet for delivering government services, both informational and transactional. It is now widely believed that by using ICT, it is possible to deliver SMART (Simple, Moral, Accountable, Responsive, Transparent) governance to the citizens. Websites have generally been taken as the `electronic face' of any government department where all information is made available.

With the advent of Web 2.0, it has now been possible to gather citizen's feedback on various aspects of the governance. This process has greatly enhanced the responsiveness and transparency in government systems. The Internet has opened up welcome possibilities to inform citizens about the rules, procedures, regulations and functioning of the government through official websites. It is evident that secrecy in government, restrictions on access to information by citizens and the media, ill-defined, complex and excessive rules, procedures and regulations, all lead to lack of transparency in the functioning of the government. All these induce the problem of corruption and also facilitate immunity against prosecution.

Since the inception of e-government, large ground has been covered in this area. Websites can serve as one of the key tools in the e-government eco-system to curb corruption by opening up the government processes and enabling larger public access to information. Adopting e-procurement system by some states in India has already shown very positive results. The Central Vigilance Commission has blazed a new trail by notifying the processes for lodging complaints, names of corrupt government officials, and so on through a monthly report in its official website. Also there are many websites around the country where online grievance redressal and follow up actions are possible. In this context, another significant milestone has been provided by the Right to Information Act for which many departments are now using ICT along with Internet, to fulfill the obligations of the Act.

Within a decade or so, the development paradigm has embraced ICT for delivering better governance, economic opportunities and social upliftment. This is being observed progressively in the developing countries, and India as no exception. Government of India has taken a conscious decision to adopt ICT in all walks of the government. The plan is in order to provide citizen-centric services through ICT means, especially via Internet, and Schemes under the National e-Governance Plan (NeGP) are underway to provide government services through Internet-enabled centres located in rural areas. The NeGP of the Government of India has envisioned adoption of ICT for delivering basic government services needed by a common man, in his locality, at affordable prices. And it is believed that broadband Internet infrastructure, which needs to proliferate across the country, is going to play a crucial role in meeting the objectives of NeGP.

Let us consider one of the flagship schemes under NeGP, of establishing 113,000 Common Services Centres (CSCs) across the country in the first phase. The scheme is now being scaled up to 250,000 such Centres as Bharat Nirman Common Services Centres, to be located one at each Panchayat in the country. It is planned that these centres will deliver government-to-citizen, citizen-to-government, business-to-citizen and citizen-to-business services to those specifically located in rural India. Behind this plan there is a thought process for all such services to become web-based over a period of time and these Internet-enabled centres with adequate bandwidth capacity would deliver those services.

Across the country, many government-to-citizen services are already being provided through the Internet, including some financial transaction services in some such Centres. One can access all relevant government websites to download the required application forms. Information about processes, concerned officials, addresses, phone numbers, e-mail ids and so on are available on Internet for almost all the government departments.

Many state governments have provisioned some web-based services for the citizens, both informational and transactional, which have created very positive impacts on the reduction of opportunity costs for the common people. On the other hand, some of the citizen-intensive business services are also now accessible through the Internet, the leading examples being ticket booking for railways, airlines, banking and financial services, and filing business returns (MCA21) by the companies. All these are demonstrating the great potential of Internet for delivering better governance to citizens.

The Government of India is further gearing itself up by creating State Data Centers (SDCs), one at every state or union territory capital and also Closed User Group (CUG) IP-based converged state-wide area networks (SWANs) connecting all government offices, which can carry voice, video and data traffic, catering to govern-to-government businesses. It is the plan of the government that most of the central and the state services will have to be provided through appropriate web-based portals, not only for informational services but also for transactional services. Many first steps in this direction have already been initiated. The SDCs and SWANs are getting integrated statewide, with State Service Delivery Gateway (SSDG) switches and the entire service delivery mechanisms planned to be integrated with the CSCs.

These CSCs are planned to be the Internet-enabled ultimate service delivery outlets for both government and private services. National Service Delivery Gateway (NSDG) portal, the national portal <www.india.gov.in> and various other state government portals are being put in place with the idea that over the time, these portals would be ready for transactional services via the Internet, with appropriate security and authentication/non-repudiation mechanisms in place to safeguard the interests of the citizen and the authority in respect of financial transactions.

There are many important government initiatives currently in progress, e.g. online passport application and tracking, online income tax return, online booking of government accommodations in tourist destinations, and online filing of corporate business returns, which are using Internet. In that way, it can be said that the potential of web-based citizen-centric services is now well understood in the corridors of government administration and it is heartening to observe that an overall buy-in among the stakeholders for deployment of Internet to provide online services is emerging.

However, there is a felt need for building the internal capacity in the government, both for individuals and departments, to embrace the technology as a whole and to get the most benefit out of it. For a large portion of the government workforce, using ICT or Internet for the daily routine work is a `green field' activity. It is evident that to take advantage of the technology, government has to take focused measures on enhancing the capacity of the government employees, to handle hardware, software, Internet, computer applications and so on. The process of such capacity building in ICT calls for evolution approaches, and patience. This is clearly understood when we see the evolution of the large IT-enabled workforce over the last decade or so, in the banks, railways, insurance, customs, and income tax department.

Furthermore, in the areas of conceptualization, planning and implementation of IT projects in government, sharing of knowledge, expertise and even data and infrastructure between government and private sector is becoming common place. We have been observing that government is increasingly using Public-Private-Partnership (PPP) and other collaborative models for implementation and operation of large IT infrastructure and service delivery projects in the government sector.

To bring in knowledge and expertise already available with the private sector in the areas of e-governance projects, the Government of India has even promoted creation of the National Institute of Smart Government (NISG), which works as an interfacing organization between the government departments and the private sector agencies, for the purpose of providing consultancy to the government departments working in the areas of IT and e-governance. However, in the long run, internal capacity has to be enhanced to meet various requirements of electronic methods of discharging government activities.

E-government Implementation: Some Success Stories

At this stage it would be a good idea to discuss, in the context of implementation and overall impact, some citizen-centric e-government initiatives which are using the Internet significantly. Let us first look at the example of the flagship CSC Scheme of the Department of IT, which is establishing 113,000 Internet-enabled rural kiosks named Common Services Centres (CSCs), equivalent to one in every six villages.

The vision statement of NeGP declares provision of basic government services needed by a common man in his locality at affordable prices. Keeping this in view, the Scheme of CSCs has been conceptualized, to have the maximum outreach for citizens by setting up Internet-enabled centres for rural India where saving of every rupee of opportunity cost matters a lot. The word `common' indicates `services', both from the government and private sector.

It is evident that delivery of government services at a rural service delivery outlet will bring a lot of credibility for such Centres but may not bring in enough, revenue to make them financially sustainable, as most of the government services are either free or priced very low. On the other hand, it is important that these Centres should have financial viability and should run with a long-term robust business model. It was also felt that provisioning of government services through CSCs would need considerable efforts on structuring of the front-end, back-end and the middleware for seamless delivery and all these may take some time.

To address this situation, it is planned to allow private services also to be delivered through CSCs so that it can bring revenue to the Centre Operators. There are around 15 service clusters have been identified under which more than 100 services are being readied for delivery through CSCs. It is planned to have Internet connectivity for all the CSCs which are being established under the Scheme. The Service Centre Agencies (SCAs) are the entities responsible for establishing CSCs with the help of the CSC Operators who are called Village Level Entrepreneurs (VLEs).

Most of the SCAs have developed their business portals which are accessed by the VLEs, for processing and delivery of various private services. The Internet connectivity for CSCs is planned for 256 kbps although the actual speed turns out lower than this. At present, the availability of Internet connectivity in rural India is not satisfactory at all. Therefore, special efforts have been taken by the Department of IT with BSNL, so that all of the planned 100,000+ CSCs are enabled with Internet connectivity as soon as possible. Various technologies, like wired (copper or OFC) connectivity, terrestrial radio frequency and also V-SAT technology are being used for providing Internet at the CSCs.

At present, more than 80,000 CSCs have been established, although many of them may not have proper Internet connectivity. It is envisaged that ultimately government and private services will be available on the web and these CSCs will be the single window service delivery outlets for rural citizens. The official website of CSCs <www.csc-india.org> gives all the details of the scheme and also posts monthly updates on various aspects of implementation, services, businesses and other issues.

The second important e-government initiative of the Government of India, which uses Internet mandatorily, is the filing of online business returns under the MCA21 project of Ministry of Corporate Affairs. Since the project was taken up in 2006, with a public-private-partnership (PPP) implementation model, MCA21 has achieved significant success in meeting the overall objective of the government in providing a single-window interface for the business houses.

Today, any registered business entity established under the Company's Act of the country can file its business return and other relevant documents (in relation to specific events) only online. This is now a mandatory requirement and manual filing of returns has since been stopped. The MCA21 process covers the jurisdictions of all 20 Registrar of Companies in the country. There are around 800,000 registered companies in the country working under the Company's Act, although there are some business entities included in this figure that are termed as `inactive' in the parlance of the Ministry of Corporate Affairs.

All these registered companies now use online filing for their returns and also provide event-related information online to the government. There is a specific portal <www.mca21.gov.in> that provides all required information, procedures and forms with online submission and stamp duty payment capabilities. If we now take a look at the statistics to understand how MCA21 is working today, it turns out to be quite a significant success story.

As of today, about 1.3 million Director Identification Number (DIN) enquiries have taken place. The figure for average daily e-filing of returns during the non-peak period of the financial year is around 8,000, while during the peak period (closing month of the financial year) it goes up to around 25,000. During the last return period, as of 29th October 2010, 70,040 returns were filed online! On the average, the requests for public documents are around 12,000 per day.

Further, the average figure for the portal hits per month is notable, with around 3 million hits during the non-peak period, going up to 8 million hits during peak period of the financial year. It is learnt that up till now the highest number of hits on the portal on a single day has been staggering 14 million! It is not surprising that Google has rated MCA21 as one of the most popular government websites in India. From this success story it is clear that user experience for using Internet for this business purpose has been extremely good and that technology has been totally embraced by the stakeholders.

The other success story of IRCTC in railway ticket booking through Internet has also been well documented. There are other similar success stories of using the Internet in India, for instance, using payment gateways like BillJunction (available in around 63 cities as of now) for the purpose of payment of government/semi-government/PSU utility bills. The `single window' services of MPonline in Madhya Pradesh, eSeva in Andhra Pradesh, FRIENDS in Kerala, eMitra in Rajasthan are some of the other success stories of the respective state governments which abundantly use the Internet as the primary mode of delivering services.

But the situation is not as rosy across the country, as it appears from the previous paragraphs. We still have to go a long way to improve the broadband Internet subscriber-base in the country. Our performance in proliferating Internet infrastructure across the far flung regions of the country is not very encouraging. In the global context of Internet infrastructure readiness index, the position of India is not at all significant. If we consider overall broadband Internet availability, it is even worse.

As per TRAI reports of August 2010, there are around 10.08 million broadband subscribers in India, growing at the rate of 3.17 per cent per month. If we take the figure for active Internet users in the country, then some reports claim 71 million active users in September 2009. The annual growth rate in this area has been recorded as around 20 per cent between 2008 and 2009. In spite of the government outlining a structured policy for broadband in 2004, somehow the required infrastructure for broadband has not gathered momentum.

For a long time, since the government created the Universal Service Obligation Fund (USOF) and positioned an administration office for utilising the same, a large number of private telecom service providers has chosen to pay the penalty charges, as stipulated in the USOF Guidelines, rather than establishing the telecommunication connectivity infrastructure in remote portions of the country. The universal concept of teledensity is for diffusion of voice telephony. Consequently, the creation of USOF was originally for voice telephony, to be proliferated in remote areas.

However, there is a paradigm shift now in this concept and most of us argue that in the today's context there should not be any concept of teledensity on the basis only of voice telephony. On the contrary, it should extend its meaning for broadband teledensity. Presumably, thinking along the same lines, the government has now extended the rules and procedures for utilising the USO fund in the rural areas for data traffic also. Some initiatives have already taken by Department of Telecommunications to facilitate necessary infrastructure through the USO fund in the rural areas. It is important that this process be accelerated, which would help in expanding broadband subscriber base, specifically in the rural India.

Mobile Governance: The Road Ahead

In the above backdrop, the significant impact of rapid proliferation of mobile telephony in the rural areas, forthcoming 3G services and broadband wireless access should be understood. A large number of rural citizens now have mobile connectivity and the number is increasing every day. They also aspire to connect to the outside world through Internet. It is probable that features required for Internet connectivity will soon be available in the low-priced phones also. There are initiatives in the industry to provide high-end features in low cost handsets.

Mobile-based Internet-related services and mobile governance are becoming a not-so-distant possibility in rural areas. It makes lot of business sense that the stakeholders take advantage of the huge mobile subscriber base in the country for value-added services (VAS). Therefore, mobile-VAS appears to be a significant emerging market in the near future. The government is also getting increasingly focused on financial inclusion and many of the government flagship schemes for rural India are likely to use mobile platforms as the last mile connectivity solution for target citizens.

However, all these said and done, we need to have the appropriate backbone capacity to handle this forthcoming bandwidth load. For our country, the numbers matter. If today 20 per cent of the rural population has mobile phones, then the figure is a significant 120 million. And to provide broadband Internet access to 50 per cent of them, the government needs to enhance the capacity of connectivity infrastructure manifold. The government appears to have bought the argument of increase in GDP by 1 per cent with 10 per cent increase in teledensity.

There is a conscious decision at the highest levels of government that the broadband connectivity should be extended to all villages, starting with time-bound broadband connectivity to be made available to all village panchayats (approximately 250,000 villages), preferably by the end of 2012. The Department of Telecommunications and TRAI had prepared necessary plan documents to meet this objective and TRAI also put forward a Public Consultation Paper in this regard.

There are substantive discussions going on at various levels on broadband implementation modality, identification of the current barriers and how to remove them in the shortest possible time. Specific initiatives like Common Services Centres (CSC) Scheme of Department of Information Technology has made some supplementary move to facilitate broadband connectivity to all the CSCs, with the help of a mix of technologies, primarily through last mile wireless solution using WiMax-enabled transmitting stations by BSNL.

The idea of a viable business model in this regard is to provide broadband connectivity to other government institutions like, post offices, schools, public health centres, veterinary centres, krishi vigyan kendras and so on. However, deployment of a moderate-to-high capacity last mile wireless solution may not prove to be successful unless the wired backbone capacity is adequately enhanced. Alternatively, the wireless backbone solution could be a temporary measure for short backhaul distances but cannot replace wired backbone connectivity infrastructure in a long term scenario.

The government's current initiative on `Broadband for All', therefore, rightly considers taking optical fibre cables to the villages so that the issue of bandwidth capacity is resolved once for all. However, to accelerate the process, some robust policy decision on `Right of Ways' (RoW) needs to be taken on priority basis. RoW appears to be the primary non-technology barrier which has to be overcome by all the telecom service providers in the country, before a single meter of the OFC is laid under the ground.

There is no doubt that, considering the current and future projection of last mile demands and services in the rural areas, wireless solutions will work for broadband Internet at the last mile for some more time. However, there should not be any doubt that the back-haul has to have adequate capacity to take the future traffic load between the service-seeking rural citizens and the service providers whose service applications may be hosted in the other distant parts of the country. And this capacity can be established only with OFC backbone laid all across the country.

Conclusion

It is an undeniable fact that the rural citizens of our country have remained underprivileged in terms of the development paradigm for a long time. ICTs, specifically the Internet, have brought in a new opportunity for India to bridge its hitherto existing development gap. Information brings knowledge. Knowledge brings, in turn, empowerment. And with empowerment, people have choices to make for a better livelihood. It is no longer a doubt in anybody's mind that ICT can provide India with enormous opportunity to bring better quality of life to its citizens. All the involved issues are well understood by all the people who matter. Perhaps well-meaning intentions also exist.

However, there are hesitations in the mind being exhibited by the decision-makers regarding the modalities of implementation and how to go about it. We have to rise to the occasion with greater conviction and intent and convert the digital divide into digital opportunities for the sake of our fellow countrymen and women. It is for sure that we cannot afford to miss this bus. If we do, little will be there for us to explain to the future generations.

Sarve bhavantu sukhinah; Sarve santu niraamayaah
Sarve bhadraani pashyantu; Maakaschit duhkha bhaag bhavet

meaning

May all be happy! May all be free from disabilities!
May all look to the good of others! May none suffer from sorrow!

References

Unlocking E-Government Potential : Shubash Bhatnagar, SAGE Publications India (P) Ltd., 2009
Impact Study of E-Government Projects in India, Department of IT, New Delhi 2008
Information Technology in Developing Countries (http://www.iimahd.ernet.in/egov/ifip/wg.htm)
http://www.ecitizen.gov.sg/ Government of Singapore's eCitizen portal
http://www.egovnews.org
http://www.mca21.gov.in
http://www.csc-india.org

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Chapter 11

Venkataraman Balaji

Internet in India

Impact on Farming

Editor's Note

This chapter highlights the challenges and the progress made in providing Internet-accessible production resources for farmers in India. ICTs can assist in providing information on the "3 Ms" of farming (materials, meteorology, markets), but a significant digital gap still exists in production content and services. Village telecentres and kiosks are only one part of the solution; institutional support, broad-based government initiatives and university participation are also essential. Some success stories, such as those of Tamil Nadu Agricultural University are emerging in India, as well as Agropedia, aAQUA, DEAL and KISSAN-Kerala.

Agriculture is one of the most important sectors of the Indian economy today, given the size of the agrarian base as well as recent alarm over food price inflation. While dwelling on the spiralling impact of increased food process on the national economy as a whole, commentators have pointed out that the continued neglect of agricultural extension, the process of linking farmers with institutionalised expertise, is one of the causes of emerging shortages in food production. This is where our story begins.

In the early days of the Internet in India, much hope was raised about its potential to transform agricultural extension. For example, an international group of experts from across the world proposed a paradigm of Computer-Aided Extension (CAEx) along the lines of Computer-aided Design or Manufacturing (CAD/CAM) (Swaminathan, 1993). Combination of desk-top multimedia and access to information networks, these experts surmised, would lead to an era where farmers could have access to key information on the 3 Ms, namely, "materials (such as seeds, fertilisers, pest/insecticides), meteorology and markets" which will help them overcome the usual hurdles in adopting new technologies for production and in finding the right prices and markets.

Is this even partly realised in 2010? This set of statements attributed to the Indian Minister for Agriculture, Sharad Pawar, has an answer

> *"Despite so many agriculture universities and research centres, why are our farm yields so low?It is not correct to say that Indian agricultural yields are universally very low. In fact, Indian yields for wheat and rice in several states are quite comparable to the best in the world. Similar is the case with yields for fruits and vegetables in many states. However, since a large part of the country is still rain-fed, average yields in many crops tend to be lower".*

Why are our farmers so vulnerable?

This is on account of two primary factors. One relates to their small holdings that tie them in a low income trap, restraining any credible investment of their income or surplus in land productivity. Secondly, 60 per cent of agriculture is still dependent on the rains. If the rains fail or there are unfavourable variations in rain or other climatic factors, then crops suffer.

This is also the time when the spokespersons of the software industry in India forecast that, in spite of continuing fiscal crisis in many OECD countries, over about 180,000 fresh hires would occur in 2011 in India. The disconnect between a thriving IT industry and the agrarian income and food production in the country has never been greater. The promise of the Internet for at least the average Indian farmer is yet to be realised as well as for agricultural sector as a whole.

Agriculture and the Web

Back in 2008, a group of scholars in International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) conducted an analysis of agriculture-related entries in the popular Wikipedia, and found that there were less than 6,000 entries in this very broad category when the total size of entries was about 1.3 million. Later in 2009, an agriculture portal on Wikipedia was launched. As of January 2011, a comparison of this portal and another in a domain such as health shows that it is still under populated. It is vastly so when compared with a sub portal in natural sciences such as biology! An entry on "high yielding variety", an important concept and practice in contemporary agriculture, at 523 words, is classified as one that is in need of improvement whereas the one on Boeing 787, just one type of airplane in a particular class of aircraft has an intricate contribution, quite unlike that on hybrid variety. More such examples can be given.

On the very popular Facebook, FarmVille is considered to be the most-widely used application, with an estimated 62 million active users. However, this popularity of farming does not translate into support for improved farming. The FarmVille designers consider it as a social gaming activity, built on the "instinct" of people to nurture - in other words, it has got nothing to do with supporting advancement of food production or the income of the subsistence farmer! The YouTube space, famous for its emerging role for as a "speaker's corner", has relatively fewer videos that directly relate to farming (a significant amount coming from KISSAN-Kerala which is covered in this article later), more relating to recipes and cooking. It is significant that no agricultural faculty in a land grant university in the US or any agricultural university elsewhere figures among the YouTube universities.

There are a number of inter-governmental and international organisations in the agriculture sector, such as the UN Food and Agriculture Organisation (www.fao.org), the consortium of agricultural research centers known as the Consultative Group on International Agricultural Research (www.cgiar.org), besides major networking organisations such as the Global Forum for Agricultural Research (www.gfar.org) and their allied organisations in Africa, Asia and Latin America. FAO, consistent with its character as a premier inter-governmental body in agriculture, has focused more on standards in agricultural information management and is in the process of building new online services in agricultural ontology (www.aims.fao.org; www.fao.org/agrovoc). FAO and GFAR have recently started to promote the Coherence in Information in Agricultural Research and Development initiative (www.ciard.net) which also focuses on standards and training of relevant professionals. CGIAR has a corporate program which is an advocacy group focusing more on intra-institutional matters with little interest in general agricultural content matters (www.ictkm.cgiar.org).

Globally, there is thus a serious gap in the presence or accessibility of information on the Internet relating to the agricultural sector. This limitation is somewhat unique since other basic and development-oriented sectors, such as health and medicine, are known to have larger amount of information on which web-services can be built. An example here is the way an inter-governmental body such as the World Health Organisation used the Internet to track the spread of the Avian Flu pandemic using vast quantities of information and data available on the Internet (https://extranet.who.int/ivtm/). A corresponding effort to forecast adequately a major crop/animal disease or even a more easily noticed event such as large scale drought cannot be easily cited yet (a micro-level exception is at http://vasat.icrisat.org/?q=node/70). This inability is directly due to the relative paucity of content on agriculture and farming in the Internet space.

Internet and Farming in India

That the vision of benefits articulated by experts back in 2002 was unfulfilled for a long time after is evident from the reports of the National Commission on Farmers[1]. In its first report[2], the NCF stated its vision for a Digital Gateway for Agrarian Prosperity in India as follows:

> *"The support system for a rural knowledge revolution should be complemented by establishing a National Digital Gateway for Rural Livelihood Security. There is need for investment in creating databases relevant to rural needs. For example, a decade ago, a National Agricultural Drought Assessment and Monitoring System was set up under the National Remote Sensing*

Agency (NRSA) to facilitate improved decision making by farmers in the kharif and rabi seasons. The potential of this system needs to be harnessed for giving proactive advice to farm families on land and water use planning. The architecture of such a gateway should be based on currently available digital content from diverse agencies, ranging from the ICAR to the NRSA and ICRISAT, with a focus on improving livelihood security in rural India. Every participant agency should be encouraged to create well-adapted and annotated digital content (maps, numeric data or documents etc.) in a manner accessible to non-specialists".

In its final report released in 2006, the NCF stated again:

"The help of ICT should be harnessed by establishing a Gyan Chaupal in every village. The Common Service Centre (CSC) programme of the Department of Information Technology (DIT), Government of India, should aim at social inclusion in the use of this important technology. The structure of the ICT based knowledge system will be as follows:

i) **Block level:** Village Resource Centre (VRC) established with the help of the Indian Space Research Organisation.
ii) **Village level:** Gyan Chaupals established with the help of the CSC Programme of the DIT.
iii) **Last mile and the last person connectivity:** This can be accomplished through either Internet – community radio or Internet – mobile phone synergy".

During this period, a large number of e-governance projects had been launched in different parts of the country, some receiving international recognition in initial stages. An earlier analysis[3] showed that agricultural extension had not been a priority in general in the e-governance projects.

A significant study[4] that emerged at this time was the one by the National Sample Survey Organisation (NSSO) which had conducted a well-organised survey covering over 50,000 farmer households across India, focusing on the information exchange habits and patterns among farmers of every type in nearly every agro-ecological region of India. This study offered numerous insights, showing clearly that the availability of Internet infrastructure in India from 1995 onwards had not made a difference to the typical farmer. Nearly half of all information transactions in relation to farm production remained informal, mostly between farmer to farmer; in the locality, the transactions reached the local input supplier/dealer and the money lender and with little exchange taking place trans-locality. The exchanges of farmers with India's famed Farm Science Centers, the Krishi Vigyan Kendras (KVKs) were significantly limited, as revealed in this survey. The NSSO report[5] confirms a trend noticed and reported from two different locations in India in 1999 and 2003. Both these previous surveys on information exchange patterns in rural Pondicherry and Telengana region of Andhra Pradesh revealed that farmers predominantly were obtaining production-related information from other farmers who may have been in the same economic situation. The serious nature of the gap between practicing farmers and the generators and custodians of formal agricultural knowledge and information, has been the subject of scholarly discussions[6] in different parts of the world, in spite of ever-widening access to the Internet. An informal survey of web sites relating to agricultural information in India carried out in 2006 reported that less than 100 sites were in existence then (Prabhakar 2006).

The twain shall meet? Internet in Agriculture and Rural Development in India

The discussions that led to IT "reaching the unreached" (Swaminathan 1993) led to a series of initiatives that sought to bring the advantages of connectivity and IT in finding solutions to the challenges of rural development through a new set of approaches (later known collectively as ICT4D in international literature). Starting in the late 1990s, this global trend had caught the imagination of many Indian thinkers, social activists, administrators and actors in the for-profit sector. An earlier set of reports and analysis revealed the range of activities in this area in India, and by early part of the past decade, India probably had the largest number of ICT4D projects in a single country[7]. At the center of this collective of approaches was the access arrangement at the village level, known variously as "village knowledge center" or "rural information kiosks." While access to government records of various types was the dominant theme in many projects, production agriculture was not a major interest in many of the initiatives (see above, Keniston et al 2005). The really big exception to this trend was the famous e-Choupal program of the ITC.

An advanced research project carried out by IIIT-Bangalore during 2005-06 covered 10 such projects (many running for over three years) in considerable depth and used the internationally accepted practices of ethnographic action research to assess the impact of such effort (http://www.iiitb.ac.in/faculty/balaji-parthasarathy/publication/). The results showed that production agriculture support through provision of information services via the "kiosk" was either a non-premium concern or was absent altogether. Where provision of Internet access to rural users was the principal concern, little attention was paid to fulfilling production agriculture information needs of farmers, as reported in a study on a group of projects in South India. A subsequent analysis[8] of this kind including more ICT4D projects from various other regions of India also revealed that agricultural information support was not a priority in ICT4D projects. A series of analytical reports[9] and papers from the Technologies for Emerging Markets group on sustainability and profitability of ICT4D projects also shows that production agriculture did not figure among the interests that the kiosks were expected to serve for profits/income or in providing a public service to the rural population.

The Other Strand: ICT in agriculture

Institutions in the agricultural sector, especially those in education and R&D, have built and implemented projects and activities that use ICT extensively. A major initiative in this direction in India was the National Agricultural Technology Project of the Indian Council of Agricultural Research (ICAR) that was operational for seven years during 1997-2004. This project led to the creation of essential ICT infrastructure and Internet access in a large number of State Agricultural Universities (SAU) and in ICAR centers across the country. Although the IT-related implementation slowed down after the first three years, a fair amount of basic infrastructure had come into existence, however inadequate for the size of the challenges it was expected to handle. Capabilities necessary to build and maintain information and data services relevant to farmers had not been created adequately, with the result that the presence of institutionalised agriculture on the Internet was still minimal (see earlier the reference to the study by IIT-Kanpur).

The State Agricultural Universities in India play a pivotal role in sustaining and advancing agricultural productivity, and are responsible for the development of what are known as the "packages of practices" for each crop that is cultivated in a State. This document is an official one and has many levels of review and approval prior to release. They also manage a very large proportion of the KVKs to enable farmers to get information and training in important new production technologies and are expected to provide advisory and alert services. While many SAUs created a minimal IT and connectivity infrastructure over the last about twelve years, the momentum to sustain and advance the infrastructure was not generated. Making available online the accumulated data on technology trials and information and advisory services has not yet been a priority or routine activity at the SAU level. A recently completed study at ICRISAT showed that most SAUs are not in a position to offer agro-meteorological alerts online within their own territories. A notable and large exception is the Tamil Nadu Agricultural University which, since 2008, has placed on the web nearly all its extension material.

The national research laboratories, centers and field stations under the ICAR are better networked compared to the SAUs and have a better presence on the Web. Yet, few of them have Web 2.0 features or have other arrangements to enable interactivity with the "clients" (list of center web sites at www.icar.org.in). The ICAR Directorate of Information and Publications (DIPA) does not yet have significant presence on the web; as a result, critical documents, especially ones with historical value in terms of data, information and images are unavailable to build and sustain services. In the last two years, there are ongoing efforts at the Indian Agricultural Research Institute to build an Open Access repository of research publications and a small number of professional research societies are also moving in this direction (http://eprints.iari.res.in; www.ciard.net). Key data sets and information on soil and water management, gathered, analysed and stored in a number of ICAR centers, are not available online yet. This gap and the non-availability of meteorological information has led to failure to forecast key diseases, an example being the potato blight that affected production significantly in large parts of north western part of the Gangetic Plains in 2009.

The National Informatics Center (NIC) has for long been an active player in making agricultural information available online, and initiated the Warana wired project in 1998 in Maharashtra which was unique in the way it brought together agricultural information with "kiosk" operations focusing on a single crop, namely, sugarcane. While that initiative could not be sustained, NIC has placed online market prices of key agricultural produce for most of the district headquarters (http://agmarknet.nic.in); similarly, NIC has also been able to bring together all the digitally published POPs of SAUs, although the proportion of digitised POPs is still small. Lack of role clarity between NIC and the Union Ministry of Agriculture (Department of Agriculture and Cooperation) in such a publication process has been noticed for a long time and addressing this would help make available a larger quantum of agricultural information online.

We are looking only at large or long-running activities that use the Internet as a medium to enable access to agricultural information and data for farmers and their organisations. The Digital Green is an activity that generally lies outside the scope of this coverage but is noted here as a key and emerging player. The Indian Space Research Organization (ISRO), through its closed user group network of Village Resources Centers, has enabled direct interaction between experts in institutions and farmers in many parts of the country since 2005 although few SAUs are found to be partnering in this activity as of 2010. As we had noted earlier, the well- known e-Choupal program uses more of non-Internet networking to build an arrangement for sourcing of select farm produce while assuring better realisation of value to farmers and consumers.

When it comes to pricing, a significantly larger number of efforts are found and they operate on a reasonably large scale using a blend of Internet access and closed user groups. The NIC AgMarkNet is the longest running activity of this kind. The National Horticultural Board (NHB) has set up a price information system on the web with limited analytical features. Best known is the effort of Multi Commodity Exchange of India Ltd. (MCX) which covers several traded agricultural commodities extensively, with fine-grained pricing available for a smaller number of crops covering some regions of Maharashtra. Similar efforts of National Commodity and Derivatives Exchange Ltd. (NCDEX) are also notable. A new effort involving a Consortium of universities led by the Tamil Nadu Agriculture University (TNAU) focuses on prices forecast for select commodities in an accurate fashion, building on a widely-tested simulation developed at TNAU. This much needed effort is still an experimental project. In general, market price information, although not available easily at scales below that of a district (which is often expressed as a critical need by smaller farmers), is better visible on the Internet, while the same cannot be said of "material" (soil, water, seeds and other inputs) or meteorology. The original expectation, articulated in the early 1990s that the Internet will help fill gaps in the availability of information on 3Ms is still unfulfilled in India.

A different group of projects that combined elements of ICT4A with ICT4D has been developed by mainly IT expert resources. Three among them are aAQUA (www.aaqua.org) by IIT-Bombay, DEAL (www.deal.org) at IIT-Kanpur and the KISSAN-Kerala (www.kissankerala.org) of IIITM-Kerala. Another notable one is the e-Sagu project of IIIT-Hyderabad (www.esagu.org). Of these, KISSAN was the most deeply integrated with institutionalised agricultural expertise, and had its own regular episodes on a popular TV network. KISSAN also had a blended arrangement, bringing a call centre together with receiving and replying queries on a web interface, besides offering a mobile telephony interface. A GIS support unit built fine-grained plot level information on soil and cropping patterns. With active participation by Kerala Agricultural University, KISSAN is an example of what the cooperation of IT and agricultural expertise can achieve in harnessing Internet in support of farming.

Much hope was raised when ICAR launched the National Agricultural Innovation Project as a successor to the NATP. This effort, launched in 2006, has a significant proportion of resources (just under a third) allocated for enhancing information, communication and dissemination systems (www.icar.org.in/naip). Key projects operationalised by NAIP include the digitisation and online publication of all masters and doctoral theses funded by ICAR, undergraduate course material in all key disciplines of agriculture (cumulatively, about 9000-10000 lecture hours equivalent), development of a national data centre for agricultural R&D, besides sponsoring a set of targeted ICT4A projects. The results of this initiative are still coming in.

During the last three years, a consortium of IT resource institutions and agricultural universities and research institutes came together with support of NAIP (www.akmindia.in) and developed a series of prototypes with delivery modeled after KISSAN-Kerala. The content organisation was built completely anew. Called Agropedia (www.agropedia.net), this platform involves the use of semantic web practices, especially of knowledge models, with FAO's Agrovoc (www.fao.org/agrovoc) serving as the basis of an ontology for crop information. Agropedia was conceived of and architected by a team[10] at IIT-Kanpur and the validation of crop knowledge models for nine crops was carried out by a number of agricultural subject matter experts from all over India, especially those at the partner institutes, ICRISAT, University of Agricultural Sciences-Raichur, GB Pant University of Agriculture and Technology. IIITM-Kerala, host of the KISSAN-Kerala project, was a lead partner and designed and built Open Web GIS interfaces that enabled a user to overlay weather information and soil micronutrient deficiency to enable better recommendations on fertilizer input management to farmers at a local level. These two significant developments that enable agricultural content and data aggregation can now be linked to a variety of delivery methods, including mobile telephony.

Internet and Agrarian Prosperity in India: The Road Ahead

We have pointed out that there is a significant gap in availability of agricultural information and data on the Internet, and it is a global phenomenon. It is more acute in India. The non-priority status for production agricultural information in the rural "kiosk" and e-Governance projects in India has given rise to a divergence between investments and interests that drive applications of ICT in agriculture and in rural development. This needs to change.

A significant part of the responsibility in changing this is actually with the instituitionalised expertise in agriculture, whether in public or private, or for-profit or non-profit sector. The simple absence of digital content infrastructure for India as a whole is the biggest impediment in launching meaningful, large-scale information and advisory support for the farmers of India. Like the investments made by various public agencies in improving network connectivity, the key stakeholders in India's vast agricultural sector must consider this a priority area for policy attention and investment and considerable synergies need to be built as well. Given the history of good intentions and foresight that are coupled with lack of capabilities and motivation, this large task will require the participation of a number of non-standard actors. The recent success in bringing together leading IT resources and agricultural domain expertise shows that the role of non-traditional, emerging stakeholders is important. The older and continuing attitude of favoring verticality of processes where agricultural sector would build an end-to-end solution should be given up.

The IT researchers in the public sector and in industry need to carefully assess if all the technological solutions needed are readily available to meet the complex and multi-dimensional challenges of agricultural information and data management in India for multiple constituencies and in large number of different languages. There is no pre-built, readily accessible data and content organisation with which services can be created for various stakeholders in Indian agriculture. Lack of appreciation of this, in my view, has led to many lapses in recent times. The digital content infrastructure for farming in India does not exist and needs to be built as a mandate. The rapidly advancing and important initiatives in deployment of mobile telephone as the delivery mode of choice (for example, the AIRTEL-IFFCO IKSL project[11]) will also require the availability of an advanced content organisation on the Internet for sustenance. Internationally, access of farmers to institutional expertise in agriculture has not been a serious challenge in countries with industrialised agriculture and as such they can offer no models for India which needs to build its own, possibly pluralistic model. Significant investments and synergies are essential and they need to come from a variety of stakeholders including non-traditional ones.

References

[1] *www.krishakayog.gov.in; reports released during 2004-06*
[2] *http://krishakayog.gov.in/report1.pdf*
[3] *Keniston, Bagga and Mathur, 2005 http://www.uk.sagepub.com/books/Book228818*
[4] *NSSO, 2005; Report # 499 at http://www.mospi.gov.in/mospi_nsso_rept_pubn.htm*
[5] *http://www.isoc.org/oti/articles/0401/balaji.html;http://vasat.icrisat.ac.in/?q=node/48*
[6] *Carl Eicher at www.WorldAgInfo.org- 2008; Van den Baan and Samantha 2006; accessible at http://www.scribd.com/doc/36193789/Changing-Roles-of- Agricultural-Extension-in-Asia-Nations*
[7] *Keniston and Kumar 2000 - http://www.uk.sagepub.com/books/Book226642*
[8] *Dileep Kumar, PhD Thesis- http://intranet.da-iict.org/~sanjay/docs/Micro-level%20Drought%20Pre paredness %20with%20Info%20Mgt%20and%20Rural%20Knowledge%20Centres% 20A%20Framework.pdf*
[9] *http://research.microsoft.com/en-us/groups/tem/all_papers.aspx*
[10] *http://www.cse.iitk.ac.in/users/tvp/*
[11] *http://www.iffco.nic.in/iksl/ikslweb.nsf*

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Chapter 12

Usha Vyasulu Reddi

The Internet in a Developing Society

Field notes from a researcher-practitioner in the ICT for education space

Editor's Note

This chapter provides in-depth perspectives of the Internet as a harbinger of the Information Society in India, especially as seen from the point of view of technology in education and learning. From the SITE television experiment and Countrywide Classroom to Gyan Darshan and EduSat, waves of new media have enhanced education. The subsequent growth of the Internet has spawned new educational portals, classroom interventions, and state-level initiatives. Challenges arise in precise measurement of e-leaning outcomes, adapting pedagogic and administrative frameworks, overcoming the digital divide, and bridging gaps between stakeholder silos. Government and industry need to encourage the development of open standards and open source, as well as local language content. There are possible scenarios where use of ICT may be as great as its abuse.

Background: India before the Internet

Sitting around a conference table at the East West Centre, Hawaii, in the summer of 1982 and debating Marc Porat's[1] work on the Information economy as part of a programme on communication and development, participants from the developing countries of Asia were struck by the improbable vision of a 'paperless society' and of a time when the global economy would be driven by knowledge products and services and not by agricultural and industrial growth. Television was the technology of the day, multilateral agencies and nation states alike were deeply engaged in experimentation with the use of television for the purposes of accelerating the pace of change in developing societies. Throughout the 1980s and the 1990s, television remained very much the medium of the day, widely exploited, but little understood, both for its immense potential as for its vast limitations.

Five years later, as I was working on issues relating to the information revolution, I still had to spend hours waiting for a phone call to go through to the U.K. from India and had to spend large sums of money to send manuscripts through the postal service for publication in journals. I continued to wonder if the information revolution was a myth; whether a researcher-practitioner from a developing country can ill afford to hope for; and I wondered about the process of diffusion of the information and communication technologies of the day across the country.

A decade ago, around Y2K, while making decisions on networking and Internet access in my office, my concerns and debates with colleagues still centred on connectivity and access costs, speed and versatility. The remote office and the application of the Internet to address education and development issues still remained a distant possibility despite the promise and hype created by vendors who offered 'end to end solutions' but delivered end to end problems for decision makers. The Internet remained for the 'techies'.

In mid 2010, I spent a week in the more remote districts of Tamil Nadu, at the foothills of the Western Ghats, studying how communities use ICT as part of their lives. I also spent an equal amount of time in Gujarat and in Orissa as part of data collection for a wider study. In many of the villages, Internet was available as part of a village knowledge centre funded and supported by the local NGO. However, more familiar to the poor was the mobile phone with its immense possibilities emerging from its accessibility, affordability and its generative[2] capacity for different and varied applications, which transcend the barriers of literacy and language. Did this mean that the Internet has been displaced from its pride of place?

I provide the foregoing as background since much has changed in the technology and in the knowledge economy; yet little has changed in the manner of technology use and exploitation, and there remains a lack of knowledge, technophobia and complacency.

I have grown up and lived through a period without any radio, television, computers, Internet and mobile phone. Such an experience has perhaps jaded my view, which is that every new medium, when it outlives its novelty, settles into a pattern of acceptance and acceptability, finding its own niche, even when displaced by another new technology. What is not useful or acceptable is quickly cast aside by society - what is useful survives the short-term glow of public attention and awe to become an established practice until a new idea or innovation captures our imagination. The Internet is no exception.

This chapter, therefore, records key learnings from theory and my own field experience in the use of icts for education; and explores, how the Internet will mature to adulthood from being a novelty to a more stable alternative tool, both for the common individual as for the decision makers, academics, researchers, and practitioners.

An Overview of the Internet Space: Context, Evolution, Timelines

History is full of examples of both successes and failures. History also records discoveries and inventions that have been transformative in the way in which they have changed societies; for instance, the steam locomotive, the internal combustion engine, the airplane, and the satellite. The Internet, as one of the core components of the ICT revolution currently underway, is one such invention.

Openness areas like Internet standards has also been accompanied by global concerns about cyber security, personal privacy, intellectual property rights, cyber terrorism and misuse, and other kinds of criminal activities including pornography and human trafficking. What still remains clear is that the Internet is the global network of the 21st century.

Tracing the growth of the Internet in India, one would find certain key events and developments.

- The IT industry experienced a temporary boost in 1984 when the then Prime Minister, Rajiv Gandhi, identified telecommunications and information technology as a "core sector," together with traditional industries such as electrical power generation, steel, oil, and automobiles. Within a few years, the National Informatics Centre and the National Centre for Software Technology had been established.
- The New Industrial Policy (1991) saw a shift in perspective from a regulated economy to a freer and less regulated private sector. The new policy had its impact on the IT industry also, which freed of the shackles of the antiquated Indian Telegraph Act, began to blossom and grow.
- Internet had been in India for many years prior to 1995 in the form of ERNET. However, it was not possible for many people to get access to it, as it was meant for only the educational and research communities. This followed the policy laid down by the American Internet manager NSF, at that time.
- VSNL introduced Internet in India via dialup in 6 cities on August 14,1995.
- By 1998, India introduced a new ISP policy which ended VSNL's monopoly on the Internet.
- IT ACT 2000 passed by the Indian Parliament, both foreign portals such as Yahoo and MSN launched Indian sites; while Indian players also entered with Indya.com and Baazee; the large multi-national company, ITC launched e Choupal taking Internet to the villages.
- States such as Andhra Pradesh and Karnataka took the lead in egovernance initiatives in procurement and land registration and citizen services.
- By 2006, the National eGovernance Plan (NeGP) was laid down along with a road map for the use of IT, and especially web technologies, for transforming government.
- By 2009, the Internet became central to the new vision of India as an IT power in many respects. The uses of the Internet and telecommunications technologies were seen as central to the growth of the export-oriented software industry which have powered India into a global leadership position.

The Indian experience provides an example of how fundamental and focused changes in policy and legislation can unleash forces that accelerate Internet diffusion. Private sector initiatives greatly expanded the Internet infrastructure and Internet services market. At the same time, government initiatives promoted the expansion of the Internet into parts of the country not well served by private ISPs.

However, such growth in India has not been without its flipside. The priorities of good development based on a clear understanding of the grassroots have shifted away. Lent (1989)[3] has argued that :

> *"The speed with which much of the new technology has been introduced and expanded in Asia has brought undesired consequences, e.g., much dialogue previously focused on development… Has shifted to information hardware."*

The emphasis is now on the 'new' and not on the most 'appropriate'.

Many a time, I have quoted from an article by Sonia Livingstone[4] who, in an extensive exploration of the idea of newness, has argued that the notion of 'new' can either be seen with reference to the 'newness of technology' or in the context of 'what's new for society' about these media.

Livingstone further argues that by placing an unnecessary emphasis on technologies, there is an implication that technologies are the 'cause rather than a consequence of social change'[5], a perspective that is too deterministic. The perennial problems of poor connectivity, limited access, affordability and local language, insensitivity to ground reality, and relevance, persist and prove that this is not so.

The Internet and other ICTs in the Education Sector

The use of technology in education has come a long way since educational television had its hesitant start in the 1950s. Momentum triggered by the SITE and other experiments of the 1970s enabled the system to develop to a stage where India may be the only country in the world to have its own satellite dedicated to the cause of education and where, in a unique combination of small and large media, of traditional and cutting edge information and communication technologies, the country is poised to become a knowledge super power and a learning community. In the first decade of the 21st century, the euphoria of the Internet and web enabled learning has made open and distance education (with the Internet as its pillar) one of the fast growing sectors, both within the public sphere as in the private education sector.

Lessons from the SITE and Kheda Experiments underscored the critical importance of a multi-pronged approach of the application of technology in education. The building up of technological infrastructure had to be backed up by developments on the ground. Specifically, this meant the building up of institutional infrastructures; capacity building; inter institutional collaboration; attention to the educational and development dimension and the importance of social research.

Teleschool

This was the project for school children. A Central Institute for Educational Technology (CIET) formed the hub of production activity for school telecasts with six State Institutes for Educational Technology (SIETS) producing programmes in the regional languages. These were telecasted on the national and regional networks of Doordarshan.

Countrywide Classroom

For college students, the University Grants Commission's higher education programming called the Countrywide Classroom (CWCR) commenced transmission on August 15, 1984. Seventeen media centres (called the Educational Media Research Centres (EMRCS) and

Audio Visual Research Centres (AVRCS) were established in universities throughout the country, with the mandate to produce programmes.

Single Mode Open Universities

These are also engaged in the production and telecast of educational programmes. The Indira Gandhi National Open University (IGNOU) has been broadcasting since the late 1980s, while the B.R. Ambedkar Open University, Hyderabad has been sustaining a radio programme since its inception and a regular telecast of educational content since 1999. Today, IGNOU serves as the nodal agency for India's dedicated educational broadcasting channel, Gyan Darshan.

By 1991, Indian undergraduate students had access to a minimum of 12 hours of educational programming a week. Audience size for the Countrywide Classroom had stabilised at a peak of 22 million by 1996.[6]

The next major landmark in satellite use for educational purposes began in a serious way in 1991. Using one way video and two way audio as the basic teleconferencing format, these experiments over the next four years explored the technical feasibility and the educational effectiveness of using a national satellite based system for education. Research findings from all the experiments have shown appreciation for interactivity, reflected in a better understanding of both the programme content and the subject taught among all the targeted beneficiaries.

Gyan Darshan

The success of educational broadcasting prompted a demand for an exclusive channel for education and the third milestone in educational broadcasting Gyan Darshan was born on January 26, 2000. Envisaged as Doordarshan's educational channel, Gyan Darshan, a bouquet of satellite to cable educational channels, now broadcasts 24 hours a day, with original and repeat programming generated in the many educational and governmental agencies in the country. The programme mix is a blend of core curriculum based programmes in the areas of primary, secondary, higher, open and distance education, extension, technical and vocational education along with general mosaic programmes in areas of health, hygiene, arts, culture, environment, and so on.

Edusat

The fourth major landmark in India's educational broadcasting has been the development and the launch of Edusat, a satellite exclusively dedicated to educational and development programming, and now into its seventh year of operation. The purpose of Edusat was to provide support to education through low cost ground segments, and to reach the unreached in every nook and corner of India. The satellite promised high bandwidth two-way interactivity, multimedia multicasting, with a constant rate throughput and adopts an open standard approach for ease of expansion. Each user group will have a sub-hub for PC connectivity and interaction with the receiver end terminals with the capacity dependent upon the user choice. While no comprehensive evaluation study is available in the public domain, anecdotal evidence points to poor and ineffective utilisation of the tremendous potential and capacity of Edusat.

There have been a number of initiatives in India[7] in the application of ICT applications in education. The Computer Literacy and Studies in School (CLASS) project, which started in 1984 was the first systematic attempt to use computers in school education and by 1989, about 2000 schools had computers.[8] In recent years, the teaching of computer science has become an integral part of school curriculum. In the Goa Schools Computers Project[9] collaboration between the Department of Education, the Knowledge Initiative Trust that manages the project seeks to help all secondary schools to set up a computer laboratory. This path breaking initiative has helped each Goa school to have at least one computer.

In the Computer Assisted Learning Centre (CALC)[10] project, the Azim Premji Foundation has covered more than a 100 schools, where each is provided with six to eight computers and the emphasis is not on learning computers, but to learn curriculum related content through multimedia.

In Operation Headstart in Madhya Pradesh, the Rajiv Gandhi Shiksha Mission has initated a computer enabled education programme, where a set of three computers are provided in the nodal school of a school cluster called the Jan Shiksha Kendra. More than 16 CD based lessons on Mathematics, Environmental Studies, Hindi and English have already been developed for rural children.[11]

For teachers' education, steps in India include the 'Intel Teach the Future Programme', where teachers are tought how best to use technology to improve teaching and learning in 35 cities.[12] The World Links[13] network started in India in January 2002 as a professional development initiative for preparing teachers to use computers in classrooms.

In India, forty-nine schools have Internet Learning Centers(ILC) as a part of Schools Online South Asian Region program, which was launched in October 2000. The majority of the schools involved are located in under-served communities in six cities: Bangalore, Chennai, New Delhi, Hyderabad, Kolkata, and Mumbai. These schools in these states are members of the iearn India program with teachers and students participating in online collaborative projects[14].

It was at this time, by the mid 1990s, that Internet appeared on the scene in India. Holding out a promise of democratising access and enabling distributed learning, the Internet seemed the best technology to use to address existing problems. Learning content development and management softwares offered an additional promise,but through trial and experience, educational technology enthusiasts found that poor connectivity, low speed, and insufficient bandwidth inhibited the use of rich audio and visual content through the Internet.

The development of e-content then began, converging on the Sakshat portal[15]. A parallel development in the use of Internet for education has been the sudden increase in private players in the education marketplace—finding that the Internet offered limitless possibilities for the business of education to a population hungry for more and more.

The National Mission for Education through ICT has been envisaged as a federally sponsored scheme to leverage ICT, so as to democratise education by providing high quality, personalised and interactive knowledge modules over the internet/intranet for all the learners in the higher education institutions. Two major components of these are: content generation and connectivity in addition to provision for access devices for both institutions and learners. Sakshat (www.sakshat.ac.in) has been designed to be the one-stop education portal.

A hallmark of the Indian experience in using ICTs for education has been the coupling of international collaborations with a fierce self-reliance in design and implementation. India has been a testbed for experimentation with new technologies, and many pilot projects undertaken here have demonstrated promise and pitfalls, as well as leading to new theoretical perspectives and learning paradigms. The introduction of the Internet into the education space has followed a similar path. International partners, multilateral and bilateral, have worked with Indian institutions to test models, whether for television[16] in 1959 (UNESCO); for SITE in 1975 (the U.S.); the COLLIT Project[17] (Commonwealth of Learning) or the creation of Learning Object Repositories in 2004 (Commonwealth of Learning and the Consortium for Educational Communications.[18] The implementation of such projects with the 'audacity of scale' that Indian projects and programmes take has been truly an Indian experience, not emulated anywhere else in the world.

Table 1: Indian Education Sector - Market Size

	Revenues – 2008 (USD M.)	% of Total	Revenues- 2012 (USD M.)	CAGR (%)
Formal IES	**40,000**	**80**	**65,250**	**13**
K12	20,000	40	33,779	14
Higher Education	20,000	40	31,470	12
Non-formal IES	**10,110**	**20**	**19,608**	**18**
Preschool	300	0.6	1,026	36
Multimedia in private schools	70	0.14	459	60
ICT in govt schools	90	0.18	752	70
Coaching classes	6,400	12.77	11,194	15
Vocational training	1,500	2.99	3,662	25
Books	1,750	3.49	2,516	10
Total IES	**50,110**		**84.858**	**14**

Source: Dewan, S. And Vora, N. (2009), "Indian Education Sector – Long way from graduation", Sector Report, IDFC-SSKI India Research, Mumbai, India.

Public funded institutions are not the only players in the ICT for education space in India. Even a cursory look at home pages of various ISPs and DTH platforms show the very active participation and marketing of e-learning by IT service providers. Industry analysts[19] (Dewan and Vora, 2009) estimated the marketsize of India's education and training sector to be at least USD 40 billion, with a potential of CAGR five year growth rate of 16 per cent. The education market spans the Kindergarten to Grade 12 (K-12) segment; private professional colleges and tutoring institutions, vocational training, and test preparation and pre-school are other segments of the estimated market.[20]

Players in the Indian private sector ICT for Education market are many. They include Public Private Partnerships (PPP) with government such as those listed below:

- Aptech with Andhra Pradesh and Orissa
- Educomp, Everonn and NIIT with multiple states
- IL & FS with Tamil Nadu
- Terra Software Solution with Goa
- Microsoft, IBM, HP, WEBEL, C-DAC, CMC, INTEL working with multiple states
- Wipro through its foundation (Azim Premji Foundation) working with Andhra Pradesh, Chandigarh, Gujarat, Kerala, Orissa, Uttaranchal etc.

While from the supply side, it is evident that the current market is currently and potentially very big, there is very little data available about utilisation, effectiveness and relevance. In international development circles, much is made about the potential for 'learning from best practice'. Within the field of ICTs for education, the terms used are often 'good practice' or 'success stories'. Given that, many initiatives fall by the wayside after the pilot phase is over. It is more realistic to say that there has been "lots of practice', but little learning from past mistakes.

Most outcome indicators speak of quantitative measures of access and availability and rarely about the 'quality of outcomes'. In an extensive analysis of the use of ICTs in education, the Infodev[21]’ report concludes that there is very little known about the impact on learning outcomes, costs and that there appears to be a disconnect between the “rationales most often presented to advance the use of ICTs in education (to introduce new teaching and learning practices and to foster 21st century thinking and learning skills) and their actual implementation (predominantly for use in computer literacy and dissemination of learning materials)”.

Exhibit 1: Players straddling the value chain in quest of scale

Strategic Positioning of Major Players

Company	K12	Higher Education	Pre-Schools	Multi-media in private schools	ICT in public schools	Coach-ing Classes	Vocatio-nal Training	Books	E-learning
Career Launcher	✓	✓	✓			✓			
Educomp Solutions	✓		✓	✓	✓	✓	✓	✓	
Euro Kids	✓		✓					✓	
Everonn Education	⊡	⊡	✓	✓	✓	✓	⊡		✓
Excel soft							⊡		✓
Hurix				✓					✓
IMS		✓				✓	✓	✓	
Kangaroo Kids	✓		✓					✓	
Kid Zee (ETCN)	✓		✓				✓		
Mahesh Tutorials	⊡	⊡	✓			✓	⊡		
Manipal Universal Learning		✓					✓		
Navneet Publications				✓				✓	
NIIT Ltd				✓	✓		✓		
Shloka Infotech	⊡		⊡	✓	⊡				
Tata McGraw				⊡				✓	
Tutor Vista				✓		✓	⊡		

✓	Existing
⊡	Plans

Source: Industry Analyst Reports

The arrival of the new technologies for education has not been in isolation. It has been accompanied by dramatic contextual changes in the Indian education scenario and the global knowledge society. The contexts of the global economy have changed—the new contexts have radically altered our understanding of not just learning, but also of the technology that has enabled it.

The student profile in the Internet age will also change but the divide between those who can afford access to the best and others left behind will remain. This also brings the role of the teacher into focus. In all parts of the world, the conventional system of education is among the most conservative and resistant to change. Indian academia is no exception. The context of future change will be determined by the extent to which teachers and academic institutions adjust to changing external issues that their own extensive research and experience have identified as critical to success.

The third critical group is the educational administrator. The national government can play a pivotal role in framing policy, and providing vital financial support to address the issues raised earlier. It has been the enlightened and focused educational, technology and science policy that has enabled India to become a knowledge economy powerhouse. The same perspective is required for the use of ICT based initiatives in education.

The fourth part of the current educational scenario is the technology. The challenge lies in using the strengths of the Internet to address existing and changing needs of teaching and learning. To some extent, we will have to look at a new paradigm of learning, with its own grammar, pedagogy and practices.

The lesson learned from the Indian experience is that it is necessary to have policy frameworks, governance, mission statements, content norms, and partnerships worked out ahead before implementation. It is also necessary to have system management with powers, responsibilities, and accountability clearly defined. This may result in the start up of an initiative being delayed—but it is very critical for success. Prior to such a discussion on what the future of the Internet in the education space might look like, a review of the challenges that lie ahead is merited.

- The challenges of the Internet space. The concept note for the Seventh International Conference on Human Dimensions of Global Environmental Change (IHDP Open Meeting 2009) has succinctly defined and outlined societal challenges facing communities today.[22] India is no exception to these challenges. Posed as questions, the concept note refers to different challenges, which are identified as: changing demographics, sustainability, social equity and egovernance.

- The success or failure of the Internet will be determined by how societies use this tool to address societal challenges. The second major challenge posed to the Internet is what I would call the challenge of the 'silo approach'. In a technology whose fundamental component is 'convergence', the 'silo approach' runs in direct conflict with trends in the development and growth of the Internet. Specifically, there are four issues, extensively discussed by Gillet and Vogelsang[23] in their seminal publication on the issues and challenges in ICT policy—competition (for IPR), convergence (of media, and disciplines), regulation (infrastructure and services), and universal service obligation.

- The challenge for the Internet is to reduce the divergence between regulation, competition, and convergence without adversely affecting services for the ultimate user and at the same time, maintaining its generative capacity. The third major challenge is that of access, compounded by geographies, housing type and ownership status, age, gender, and employment status of 'head of household'. Some argue that gaps will persist as long as goods and services are considered 'essential or non essential'. Internet falls under the service category of a monthly payment but has two parts to payment—connectivity and access. One pays for connectivity and Internet content can be limited by portals and costs—viz. access to journals' content limited by high cost per view.

- The key challenge for the Internet is to address those issues which have an impact on increased access, affordability, adaptability, ease of mastery, openness to participatory forms of communication, and generative capacity. The fourth major challenge is the overwhelming presence of a paternalistic culture and a bureaucratic frame of mind. The Internet, as a digital technology is transformational and different. In older technologies, shaping and production of content and the delivery methodologies remained one way in the public hands. The new digital ICTs are potentially more open and can be owned and operated by an individual or social group, i.e. ownership has shifted to the hands of the person who can vary the purpose for which the technology is being used. This democratizing power of the Internet runs in direct conflict to the existing power structures. The Internet allows for the articulation and aggregation of knowledge, needs and interests. When such needs and interests are not properly addressed by the powers that flourish in centralised decision making, be that of administrators or that of the knowledge providers, there is little or no uptake from the ground.

The Internet brings about a paradigm shift. It has all the advantages of reach, speed, and interactivity, while at the same democratizing access to information and knowledge. The challenge for its growth and utility as a technology for all depends on the extent to which control over the technology shifts from the provider to the user. This, in turn, depends on deregulation and the creative of supportive government policies and practices in the use of spectrum. Else, other technologies such as radio and mobile based distribution systems will have a distinct advantage.

India's Position in the Internet world

According to a release of the Internet Governance Forum meeting at Hyderabad in December 2008, India ranked fourth in the world in Internet usage, with 81 million users or seven per cent of the population[24]. This includes people who have direct access, as well as those who use the Internet, but do not directly subscribe to it. India currently ranks 54th on the E- readiness ranking behind both China and Brazil[25], but when analyzed, much of this information camouflages two very real and very different realities. The first is the pre-eminent role of India as an outsourcing destination for IT enabled services powered by the very large pool of technically trained human resources (in engineering as well as in humanities, social sciences, and education) coupled with a fluency in English, the language of the Internet.

The second very different reality is the existence of pronounced digital divides--between those who can afford to access the Internet and those too poor; between urban and rural areas; and between those who have a decent broadband (high speed) Internet connection and those who do not. The data also hides the impact of numbers, where any improvement seems negated by numbers, despite huge strides in the provision of infrastructure and services, and the increased affordability consequent to reduction in access costs.

The Internet's position as a medium of communication is also challenged by mobile telephony, with India being the fastest growing mobile phone market in the world.[26] Couple this with the advancements in access to conventional radio and television; and the position of Internet seems under further challenge.

Internet in India in the next 15 years

Most of the problems identified in ICT based initiatives relate to either governance and management, or logistics. There is a need to ensure integration between stated policy objectives in the ICT and Education policies and initiatives, and administrative capacity of education departments on the ground. Monitoring and evaluation strategies in Education initiatives need to focus not just on program evaluation but also evaluation of learning levels of students.

The future for India as an IT superpower is very rosy, especially as Indian capabilities in IT applications and solutions continues to grow and despite the much hyped criticism of outsourcing in the West. Intra county disparities in the use of the Internet will gradually reduce, subject to the enlightened policy making and regulation in the four key areas of competition, convergence, regulation, and the meeting of universal service obligations. The proactive role of the private sector will drive down costs; but the industry and the education sector's ability to develop low cost local language content, deliverable through the mobile web applications, will determine the extent to which Internet will grow in underserved areas for marginalised populations and locations.

A second concern is that as security, privacy, and intellectual property rights become more important, the open spaces of the Internet are increasingly being locked down—either for security or business reasons. The nature of the web is changing and is losing the very openness that has been its hallmark. Therefore, the challenges for the Internet will continue to grow and to clash. Businesses will evolve to leverage personal information, and intelligent search engines will predetermine individual users' requirements and tastes. These will bring to the debate, important issues such as ethics, governance, and accountability, and consequently new human and social dimensions of regulatory practices.

In India, the Internet is only at an early adoption stage, but growth will be dependent largely on issues of access and affordability, on the available of local language content, and the extent to which Internet adapts to changing social contexts and conditions. Copyrights and intellectual property rights issues, alongside paid services, will affect its growth.

For e-governance purposes, the use of Internet will depend not on the technology but on the 'trust deficit' between government and citizenry, and growth of social media.

Recommendations for Policymakers

Much of the friction between the pace of change in technologies and public policy has been because of the latter's inability to keep pace with change. Public policy is always in a 'catch up' mode. Policy makers, mostly government, should recognise that government need not be the provider of telecom or IT services, except in those social sector areas where it has constitutional responsibilities. Government's role is to do what is good at; be responsible for planning, structuring, and regulation; and setting down norms and laws that define fair play and a level playing field while protecting public interest.

Government needs to encourage the development of open standards and open source because these are generative rather than restrictive and allow for greater participation from all sectors. Local language fonts, and locally developed content need constant encouragement.

Policy makers also need to understand that information and communication technologies, with Internet as a key component, are transformational in nature and therefore, there needs to be a paradigm shift in the way government itself operates. Policy and decision makers must move toward change management, rather than technology management. Policy makers also need to change to a perspective of encouraging change rather than resisting it.

Policy makers need to spend more time to understand the social dimensions of technological change. Issues of access, affordability and relevance will remain paramount and if a policy of technological determinism continues, the benefits of the Internet will rarely be visible.

Specifically, government would have to proactively invest in long term research and innovation, to rethink ways and means by which the Internet will change society and business. A major push in such research would have to be in socio economic research to ensure that social factors such as access, equity, and affordability are taken in account as priorities.

These directions, in turn, to lead to a supportive regulatory environment so that the full potential of the Internet can be exploited by all, not just for the information rich, while protecting individual rights, language, and cultural diversity.

Recommendations for Industry

It is globally acknowledged that ICTs have an important role in spurring economic growth. Countries that have high levels of economic development also have high ICT penetration rates. There is evidence that business and industry have benefited the most from the information revolution. ICT infrastructure and human resources development have given rise to high growth rates in countries like India and China, transforming them into powerful economies in the information society.

The transforming impact of ICTs has also been visible in the small and medium enterprise (SME) sector, for increasing efficiencies and global exposure.

Financial sustainability of Internet based applications and activities is no doubt important, but industry must also address issues of 'social sustainability'[27], the extent to which an Internet or ICT based initiative gets embedded into the society. In a socially sustainable programme like the GVK-EMRI[28], which is based on an Internet backbone; even the mere shifting of an ambulance from a village is prevented by villagers. Another example of a socially sustainable Internet based enterprise is ITC's eChaupal, linking farmers to markets.

Internet carriers and regulators must work together to make a low-cost network to come to fruition. Until this is done, expansion of networks will be slow, and acceptance, even less. Even more, the Internet runs the risk of being overshadowed by other low cost mobile communication devices and applications. Translation technologies, local language content development and customization for cultures and language groups is, an area meriting careful attention if the Internet is to continue to grow.

Conclusions

We ignore history at our own peril for there are lessons to be learnt there. Three and a half decades of work on and with emerging technologies of the day has taken me through the euphoria of innovation to a reality that it was not so much the technology as the substance and the functional utility of it that made a difference. The revolution in air transportation did not replace the railroad or displace the automobile. Each found its place and its niche in relation to the community it seeks to serve. Television did not replace radio; and the Internet has not replaced the television.

As a doctoral student doing research into the effects of television on adolescents, I found that the theoretical framework of the 'uses and gratifications' best expressed what young people did with a new medium. However, it would perhaps seem blasphemous to the Internet enthusiasts to hear some one say that the Internet's future will be similar to that of television, though it brings interactivity and unleashes creativity and shifts the power into the hands of the user.

While it is true that the Internet has transformed the way in which industry conducts its business and in the way that we communicate; two factors will determine the future—its utility as a communication medium and the satisfaction or gratification one derives from using the Internet.

If I were to repeat my doctoral research again, this time on the uses and gratifications of the Internet; I would find that it is put to use for many a purpose other than information and education or and even development; I would find that social networking sites which enable users to chat with friends from far away fulfills a 'social relationship' function, that surfing the Internet may help users pass the time; that addiction to the Internet is a sign of a behavioural disorder; and that like all other information tools, pornography, voyeurism, and crime, an invasion of privacy and abuse of user rights are part of the uses that Internet is put to.

I foresee a scenario where use of the Internet will be as great as its abuse. We will need to address the psychological compulsions that lead to the addiction to the Internet. Some parents told me in the villages of India during a recent survey of ICT use, that television was the worst form of entertainment inflicted on their children. Will they soon say the same as the Internet penetrates the far flung and remote villages that dot this country?

So, in the times to come, Internet will become one more tool reflecting society at is best or at its worst. With regulation, it will lose its generative and creative capacity and without regulation, it will, like all media, reflect society, warts and all.

But people like me will continue to be enthusiastic until reality dawns on us and we learn the lessons of history.

References and Resources

1 *Porat, Marc U and Rubin, Michael R. (1977), The Information Economy (9 volumes), Office of Telecommunications Special Publication 77-12 (US Department of Commerce, Washington D.C.)*

2 *The term 'generative capacity' has been used by Jonathan L Zittrain (2008) The Future of the Internet and How to Stop It. New Haven: Yale University Press to describe platforms that are 'open, even unfinished' and enable and unleash the creativity and imagination of the user to determine the way that the platform can be used. http://futureoftheinternet.org/download (retrieved August 30, 2010)*

3 *John A Lent (1989) "Mass communication in Asia and the Pacific. Recent trends and developments" Media Asia. 1989;16(1):16-24*

4 *Livingstone, Sonia (1999) New media, new audiences? New media and society, 1 (1). pp. 59-66. ISSN 1461-7315; http://eprints.lse.ac.uk/archive/00000391/*

5 *Ibid.*

6 *ADMAR (1996) National Vierwership Research Survey on UGC Countrywide Classroom Programme in India. New Delhi: Consortium for Educational Communication. Unpublished report*

7 *Usha Reddi (2003) Ïndia"in Glen Farrell and Wachholz op. cit. p.249-251*

8 *Binod C. Agrawal (1996) Pedagogy of Computer Literacy: An Indian Experience. New Delhi: Concept*

9 *See www.gscp.org*

10 *See www.azimpremjifoundation.org*

11 *See www.bhojvirtualuniversity.com/abt_headstart.htm (retrieved 09 January 2005)*

12 *See www.educationinindia.net*

13 *See www.world-links.org*

14 *See http://www.schoolsonline.org/whatwedo/india.htm (retrieved 31 January 2005)*

15 *http://www.sakshat.ac.in/ (retrieved September 14, 2010)*

16 *Wilbur Schramm (1964) Mass Media and National Development. Paris: UNESCO*

17 *Usha Reddi (2003) Ïndia"in Glen Farrell and Wachholz (2003). Meta-survey on the Use of Technologies in Education in Asia and the Pacific. UNESCO, Bangkok*

18 *http://www.cec-ugc.org/ (retrieved September 17th, 2010)*

[19] *Dewan, S. and Vora, N. (2009), "Indian Education Sector – Long way from graduation", Sector Report, IDFC-SSKI India Research, Mumbai, India*

[20] *"ICT-based Education in Schools: Emerging Business Models in India" G.S.Vidyashankar and L.Prakash Sai Department of Management Studies, Indian Institute of Technology Madras, Chennai – 600036, INDIA. http://www.unescobkk.org/fileadmin/user_upload/apeid/Conference/13th_Conference/Papers/3.A.3._Vidyashankar_Gourishankar.pdf*

[21] *Infodev (2005)Knowledge Maps: ICTs in Education. The World Bank www.infodev.org/en/Document.8.pdf*

[22] *http://www.openmeeting2009.org/concept.html (retrieved February 14th, 2010)*

[23] *Competition, Regulation, and Convergence: Current Trends in Telecommunications Policy Research. Edited by Sharon Eisner Gillet and Ingo Vogelsang. Lawrence Erlbaum Associates 1999*

[24] *http://www.techarena.in/news/7527-india-ranks-4th-world-internet-usage.htm (retrieved August 30, 2010)*

[25] *http://graphics.eiu.com/pdf/E-readiness%20rankings.pdf (retrieved August 31, 2010)*

[26] *http://online.wsj.com/article/NA_WSJ_PUB:SB123413407376461353.html (retrieved August 30, 2010)*

[27] *Madanmohan Rao and Nanditha Raman (201) ICT4D: Learnings from Best Practices and Roadmaps from the Pan Asia R&D Grants Programme. Singapore: Asian Media Information and Communication Centre and Wee Kim Wee School of Communication and Information; Nanyang Technological University.*

[28] *www.emri.in (an Indian social enterprise providing emergency medical services in the health sector) retrieved September 3, 2010*

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Chapter 13

S. Sadagopan

Impact of Internet on Educational Institutions

Editor's Note

This chapter traces the impact of Internet and mobile services over the last 15 years on the educational institutes in India. The Internet has deeply impacted the youth and the 4L's of Learning: Lecture, Library, Laboratory and Life. Course video lectures address the needs of undergraduate engineering colleges in the form of NPTEL (National Program on Technology Enabled Learning). A number of online assessment tools permit many examinations to be conducted online. Availability of laptops and Wi-Fi's on campuses has played a role in improving the students learning experience considerably. INDEST (Indian Digital Library in Engineering Science & Technology) has "levelled the field" for Indian researchers, particularly in less established (and less endowed) universities established in remote areas. Books and news media are being rapidly converted to digitised forms. Emerging frontiers include mobile learning and local language educational content. India should take an "invest and benefit" approach to e-learning rather than mere "cost justification."

A lot has changed in the Internet eco-system from the perspective of its usage and impact in the education and research community in India. We have witnessed googlization of the web content and the evolution of a whole range of e-services (e-book, e-library, e-learning, e-banking and e-ticketing). The Web 2.0 era brought life into the static websites with the emergence of blogs, IM, Facebook , Orkut and Twitter. Mobile telephony zoomed from zero to nearly 700 million subscribers, and thanks to smart phones, mobile Internet has become popular. This explosive growth has led to an increasing demand for higher bandwidth Internet access as well as supply of manpower to sustain the Internet services offerings.

Politically, the clout of BRIC Nations (Brazil, Russia, India and China) is increasing. India seems to be getting integrated into the global economy that is epitomized by the outsourcing debate that goes all the way to the White House and reverberates in the Indian Parliament with the speech of none other than President Obama on November 8, 2010!

Early days

Internet came to India through the UNDP-funded ERNET (Education & Research Network) project in 1986[1]. It was perhaps one of the first projects where all five (at that time there were only five!) IITs, IISc, NCST (part of TIFR) and DoE (Department of Electronics, that later became Department of IT) were involved. None other than the father of the TCP/IP Protocol Dr Vint Cerf was the "reviewer" for the project. It gave an opportunity to the researchers in IITs to get involved with the then cutting edge technology and global practices around Internet. It is satisfying for many of us (who were a part of the core group of ERNET) to see the proliferation of Internet, and the abundant benefits of Internet access enjoyed by millions of Indians everyday.

With the setting up of the National Informatics Center (NIC), Government officials could get limited access to Internet soon after, and by 1991 practically every IAS officer in India and his / her office had Internet access.

The public at large had to wait till August 15, 1995 (48th Indian Independence Day), to get access to the Internet. Initially the users were in hundreds and thousands. It was expensive too; a full TCP/IP account would cost Rs 15,000 per month (more than a professor's monthly salary then) though there was a cheaper "dial-up" option as well as a special 'student's account', thanks to VSNL being a Government company then (later, Tata purchased it from the Government during disinvestment and VSNL became Tata Communication[2]). Access was limited as well; many telephone exchanges were not 'good enough' to provide 'data services'. Of course, things improved considerably in five years; by the year 2000, basic access-related technical difficulties were addressed well by VSNL. Later, private sector was allowed (after the break up of VSNL monopoly), followed by mobile phone service providers offering data services. Thanks to GPRS, mobile Internet became affordable and easy to access!

- Of course, there was not much India-specific content to browse and most content was US-centric and in English language. Mostly, Internet was used to send email; though the usage was as varied as one could imagine.
- Many parents in India began looking at email as a low cost option to keep contact with their children studying in the USA and elsewhere.
- Some Bihari migrant workers began sending messages to their family - thanks to some philanthropic minds in Chennai, setting up accounts and facilities to print the mail and sending it to the recipients.

Internet changes everything in India

In the past fifteen years a lot has changed, thanks to the Internet.

- Millions of Indians booking their train tickets on the Net using the IRCTC (Indian Railways Catering & Tourism Corporation) site represents an application that touches the *aam admi* (common man). With more than 10 million online transactions through the Indian pavement gateways alone in the month of October 2010[3], it is the largest e-commerce provider in India, surpassing even many banks.
- Start-ups like Redbus, provide online ticketing solutions to bus operators - from small-time operators with just a handful of buses to State Road Transport undertakings with thousands of buses - who do not have the expertise in running on an online reservation system[4].
- The world and India shifted to 100% e-ticketing two years back.
- Users, especially the young, routinely book cinema tickets, shop, look up restaurants and recipes online.
- Thanks to Web 2.0, blogs, photo albums over Picassa and Flickr, web-mail (Hotmail, GMail, Yahoo Mail & Refiff) have completely sidelined the telegram and the post card. Orkut, FaceBook and Twitter are the 'hangout places' for today's generation.
- Both the youngsters and senior citizens have moved to online banking thanks to the 'directive' of 100% computerization by March 31, 2010 by the then CVC Mr. N Vittal, way back in 2000.
- With the rise of the 'global Indian', many parents have made, Internet chat, webcam-based video sessions and Skype their everyday habits.

All these changes have transformed the very life style of Indians in major metros and cities, though small towns and rural India are far from well connected to this Net revolution.

Web-presence has become universal in India.

- Even the smallest corporation, school, college, government department, hospital, and even temples, let alone large enterprises, have a web site today.
- Indian government departments, both at the Centre and in the States are implementing large-scale and ambitious e-Governance projects with budgets that run into billions of dollars and are billed as the largest such implementations in the world.
- Even from a technology perspective, the UID (Universal ID) project "Aadhar" is the most ambitious citizen ID project in the world. In a rare coincidence, Mr. Nandan Nilekani - who along with other co-founders built the iconic and financially successful enterprise Infosys – decided to risk his reputation and financial success, to the head "Aadhar" project on a personal invitation from Prime Minister Dr. Manmohan Singh[5].
- Most urban users started using the Net as the primary source of information, particularly for postal addresses and phone numbers.

With mobile phone population crossing 700 million on August 31, 2010[6], and 3G licenses already issued on September 1, 2010, Net usage will see further dramatic increase from 2011 onwards.

Internet impacts all 4L's of Learning

Education is perhaps one segment that has benefited the most from the Net in the past fifteen years. This period also coincides with the period when India is benefiting from "demographic dividend" – with India having more than 40% of its population in the sub 25 years of age and expected to have this huge labour poll advantage well into the year 2050.

> *"CIA Fact book estimates a total of 64% of India's 1,173.108 million people to be currently of an age to contribute to her labor force. It is also estimated that by 2020, the average age in India will be 29 as opposed to 37 in China and the United States, 45 in Western Europe, and 48 in Japan. Demographic projections place India in a very enviable position in terms of dependency ratio (dependent population relative to the working-age population) by 2040. Demographically speaking, there is a very good reason to jubilate".*[7]

Education is the key input that needs to be strengthened if this dividend has to be converted into tangible economic and social benefit. The explosion in the engineering colleges (with more than 2,000 colleges graduating nearly half a million engineering graduates every year) in the past two decades by way of:

- near doubling of capacity in all IITs
- starting more IITs and IIM's in the current decade than what was created in the previous five decades
- upgradation of RECs into NITs
- creation of many IIITs

are all indicators of this explosive growth. It may be interesting to note that India used to produce a much less number of technical graduates compared to the Unites States for several decades (USA graduates about 75,000 undergraduate engineers), but in the past two decades the annual number of technical graduates from India has gone far higher.

With such explosive growth and the acute shortage of faculty, the quality of education imparted to the youngsters would have suffered much more, but for the widespread access to Internet among college students. While there is a definite concern about the quality of education in many of thess institutes, it is not that alarming, mainly due to the technology-enabled substitution of teacher-led education by e-learning. Though by no means a substitute for exemplary teachers in the classrooms, access to the Internet, free availability of high quality educational materials and networking among students has reduced the impact of the quality crisis. Let us elaborate the impact of the Internet on the 4L's of learning.

Lecture

Lectures are considered integral to education, particularly at the University level education. Technology in the form of blackboard and chalk, transparency foils, slides and PowerPoint (and similar lecture presentation programs) has changed the face of classroom lectures. With the connectivity provided by the Internet, students have access to many presentations on the same subject, by multiple teachers from the same institution or from institutions around the globe. Thanks to the pioneering effort to make full-course video lectures on dozens of core and elective courses that address the needs of undergraduate engineering colleges in the form on NPTEL (National Program on Technology Enabled Learning)[8], that is available to students across the country (including students enrolled in rural India), there was a dramatic "level playing" exercise aimed at increasing reach to students. Google agreeing to host NPTEL videos under YouTube, and made the distribution very efficient, that allowed thousands of students to routinely view these educational videos. OpenCourseWare project of MIT, USA, that made hundreds of MIT course materials (Lectures, home work, and projects) available free online, pioneered the use of online courseware. Several universities have made similar attempts albeit with varying success[9].

Along with the online course distribution, a set of tools known variously as LMS (Learning Management Systems)[10], CMS (Course Management Systems), e-Learning and on-line assessments started appearing on the scene, addressing the needs of students, teachers and academic administrators.

CMS uses Web-based tools to create course materials – lecture notes, slides and reading material – and post it online without the teachers having to "HTML code".

LMS on the other hand addresses both CMS needs as well learner needs – allowing students to read and submit assignments, interact with the teachers and fellow students using discussion groups, e-mail and more recently blogs and other web 2.0 tools. LMS also helps in posting individual grades and other evaluation information to students and optionally include a grading tool to help instructors in assigning individual letter grades. Other supporting tools, such as online feedback, online poll and grade submission for registrar, are also supported by LMS tools. Commercially successful LMS tools include BlackBoard[11]; while many institutes use open source tool Moodle[12].

A number of online assessment tools (pioneered by Prometric) permit many examinations to be conducted online. GRE (Graduate Record Examination) and TOEFL (Test of English as a Foreign Language) – conducted by ETS (Educational Testing Service)[13] internationally moved to online around 2001. Service providers like MeritTrack[14] have started offering testing as a service at hundreds of test centers across the country. Thanks to MeritTrack, many Institutes including IIIT-Bangalore have moved their Entrance Examination online. The high-profile CAT (Common Admission Test) for admission to MBA programs went online in 2009, though with some glitches; the 2010 edition has gone off without any major problem. GATE (Graduate Aptitude Test in Engineering) for admission to M Tech degree programs went online partially in 2009; by 2011 it will be completely online.

Companies like Everonn and Hughes have set up hundreds of learning centres where online lectures are broadcast over the Net into individual workstations. Other companies like Cisco, using their WebEx tools are targeting the education space too. Institutes, including IIM Calcutta and IIT Delhi, have used such infrastructure to extend their education. IIT-Bombay has pioneered many synchronous learning experiments in the past five years. The annual conference T4E, (Technology for Learning)[15], that started in 2008, documents many such experiments. Interestingly, T4E conference series started at IIIT-B.

In a nutshell, the Internet has transformed "lecture" as a key element of learning; it is available in "any time, anywhere" mode, thanks to LMS; most lectures are available almost free to students. With flexible online examination, and soon the much talked about Graduate ID for every college student, and online transcript, the learning landscape would have changed fundamentally, thanks to the Net.

Two related developments in the past ten years – the low cost availability of laptop computers and Wi-Fi access – has made the access to lecture materials on any time, anywhere basis, amplifying the benefits dramatically. Interestingly, IIIT-Bangalore pioneered both these – an individual laptop for every incoming student way back in 1999, partial use of Wi-Fi in the year 1999 and full campus-wide deployment in the year 2003.

Library

Libraries are so integral to education that one cannot think of any University campus without a large central library. They are at the center-stage of the learning experience. Internet has transformed Libraries so fundamentally that Libraries are almost disappearing from the physical scene at an alarming rate!

Perhaps the most important impact is in the area of journals. First rate scientific journals are very important to scientific institutions and the researchers working at these institutions (both professors and their PhD. students); unfortunately, these were extremeley expensive, originating mostly outside India. With air courier being expensive and access to foreign exchange difficult till recently, most institutes in India suffered both in quantitative access and timely access; very few institutes could subscribe to many journals and the ship by sea option ensured that journals arrived 4 to 6 months after their original publication time. In the competitive research arena, it handicapped Indian researchers. Things changed dramatically in the year 2000 when ACM (Association of Computing Machinery) and IEEE (Institute of Electric and Electronic Engineers) started their Digital Library services. Thanks to the consortium approach, such digital libraries started to be available at much lower cost – from over $ 45,000 per year in 2001 to $ 4,500 today – thanks to INDEST (Indian Digital Library in Engineering Science & Technology)[16]. Digital Library has levelled the field for Indian researchers, particularly in less established and less endowed universities in remote areas. Researchers get immediate access to most journals and conference proceedings. In addition, citation information (that used to be available to very few university libraries as the Science Citation Index was very expensive) is also available now to most researchers.

Books too have changed dramatically in the past ten years. Many books are available as e-Books; organizations like Google and universities and individuals have digitized many books. Amazon sells many new books in digital form (in addition to print). Many self publishing authors have published only in the e-book format.With Amazon Kindle, Apple iPod, Barnes & Noble Nook and Sony, eBook reader starting to become available, the digital library movement will see yet another transformation.

Many items of popular press (magazines, newspapers and special reports) have quickly moved to digital form. Many magazines globally (BYTE, for example) and in India (IT Magazine) stopped their print versions and moved completely to the digital format. Current Science from Indian Institute of Science is available free online (though print subscription is priced). IEEE is starting, in 2011, free subscription of their flagship magazine IEEE Computer in digital form, as part of the heavily subsidized student subscription, in countries like India.

In summary, digital library has brought access (mostly free or near free of cost) to most students in India (and other countries like China) that will have far reaching impact on research publications from counties like India in the next decade.

Laboratory

Laboratory is yet another key constituent of learning and that too has been impacted by the Internet, fundamentally. The near universal availability of laptop computers and Internet access (wired and wireless) across university campuses meant that the traditional undergraduate laboratories in computer science:

1. programming languages
2. operating systems
3. data structures, algorithms
4. databases,

are available in any time, anywhere mode for all the students; the laptops are powerful enough to store academic or open source versions (including source code) of compilers, operating systems DBMS and libraries. In a sense, the students no longer are limited to brick and mortar laboratories. With remote login facilities and full, secure access to Internet (thanks to VPN), more demanding and expensive software tools can be 'served' from the servers, once again in any- time, anywhere mode.

For non-computer science and hardware dependent laboratories, a number of tools including MatLAB from Mathematica and LabView from National Instruments provide enough laboratory simulation for most engineering curricula. With in-built signal processing and multimedia capability, "Language Labs" can be completely run out of PC / Mac computers. Several design, architecture tools (that heavily exploit CAD / CAM tools) provide laboratory environment on standard workstations.

The pioneering experiment iLab[17] at MIT (funded by HP) has gone a step further in bringing heavy, expensive and exclusive laboratories (universal testing machines, experimental nuclear reactor, microscope, sophisticated medical equipment, crystallography instrument, biological instruments, telescope and many other instruments) to be used remotely from students across the world (who partner with MIT and other institutions).

The Internet, thus, has dramatically changed the notion of laboratories that are brick & mortar spaces that must be physically housed in each and every university / college. Today, many colleges can offer first rate laboratory access to its students without necessarily investing in their physical laboratories, something that would be unthinkable ten years earlier.

Life

Finally, learning, particularly at the university education level, happens at places beyond lecture halls, libraries and laboratories. It is in the form of "peer learning" when students undertake group projects, discussions and other buddy-learning schemes. Internet has changed such social interaction too, fundamentally through a whole range of web 2.0 tools such as blogs, social media tools (Orkut, FaceBook and Twitter). Such tools are profoundly impacting college students and the way they learn, internalize and deploy knowledge learnt in the lectures, laboratories and libraries. In fact, this is an area where we professors are learning from students.The multi-tasking Gen Next is discovering news of using these "Life tools" and integrating it into their learning methodology. Researchers will be kept busy over the next decade to unravel the depths of such new forms of learning.

Mobile Internet

Yet another area where a lot is happening in India is the emergence of mobile Internet. With mobile user base crossing 700 million (as of October 2010) and the monthly addition of more than 15 million new subscribers every month for the past 18 months, India is witnessing an unusually high level of acceptance of mobile phones. With GPRS enabled phones available at sub Rs 3,000 level, GPRS tariff falling dramatically and 3G services set to start from Diwali (November 5, 2010), mobile Internet will take off in a big way. Already,

- Mobile-based search is available to most Indians.
- Many youngsters "check in" into flights and check their train reservations using SMS,
- With mobile banking rules framed by RBI (Reserve Bank of India) and mobile trading of stocks permitted by SEBI (Securities & Exchange Board of India) Internet will be the primary channel for banking & trading.
- Many e-governance schemes are mobile ready.
- With many mobile handsets providing web 2.0 tools (FaceBook & Twitter) right on the homescreens of smart phones, the Gen Next Indians wil use Internet mainly from mobile devices.

With Apple, BlackBerry and Android phones giving a hard time to the established leader Nokia in handsets, and smartphones becoming the main-line phone in the next couple of years, mobile Internet will be the primary Internet in India. It is too early to predict the impact of such development, but it is most likely to be exciting and transformational. With Aaadhar (Universal ID) of the UID Authority of India likely to consider mobile device as yet another device to provide ID authentication, mobile Internet will start benefiting hundreds of millions of Indians in the next four years.

Opportunities and Challenges

Of course, the exciting possibilities have many challenges too. While the middle class in India (about 500 million) that can benefit from Internet opportunities is increasing, we still have large part of our population (nearly 300 million) below poverty line, illiterate and lacking access to even basic amenities (drinking water, housing, sanitation, education and basic healthcare). Unless we have schemes to include the entire population in our scheme of things, the country will not prosper much. This is something that must be carefully considered in all our future plans.

Issues of:

information privacy,
information security, and,
equitable access to information

are other issues that must be carefully factored in before Internet benefits can widely impact all sections of the society.

Finally,

localisation,
local language content, and,
localised user interfaces

are issues that must be addressed too.

Some personal reflections

Starting from the days of ERNET project (that brought Internet to India), many of us have been personally involved with the VSNL rollout across India. On December 31, 1995 when the IIM-Bangalore web-site was on the Internet, it was front page news in Times of India I vividly remember the conversation I had with the Times of India correspondent as to why he published it as front page news The statement, "the fact that none of the IIMs had Internet presence in 1995 and IIM Bangalore was the first IIM to have Net presence was the reason I considered it front page news", was telling. Many of us had been personally involved with many Internet-based startups including FabMart (Internet Book store), 01Markets (Internet exchange), Indya (India-centric portal) and Internet-centric low cost airline Deccan Air. Projects like OLPC (One Laptop Per Child) and similar experiments at the university level, "Teach to the Future" project of Intel that enabled more than one million teachers trained in computer use, Schools Project of Microsoft, Cisco University, Infosys Campus Connect, Wipro Mission 10X, Tablet PC, Classroom PC, NPTEL, INDEST, T4E, IIIT movement, ICT in Schools are projects where many of us have been intimately involved.

Pioneers

The pioneers of Internet use in India include:

IITs

- NPTEL Project: A special project funded by the Ministry of Human Resource Development (MHRD) brought all IITs together to create several hundreds of course-related lectures in the form of educational video through NPTEL (National Program on Technology Enabled Learning). This dramatically levelled the 'access to high quality content' for a large number of rural colleges in India, particularly after Google decided to host the videos under YouTube platform. While MIT's OpnCourseware project (and other Institutions that are today part of OpenCourseware Consortium) provide outstanding content (Lectures & support materials) on a wide range of subjects, NPTEL focuses on the common curriculum that is used by most of the undergraduate engineering college students in India. In the process e-learning is not just enhanced opportunity to interested student, but essential curricular materials to all Indian students – a rare USP in the Indian context.
- INDEST (Indian Digital Library in Engineering, Science & Technology) Consortium: Another pioneering initiative of the IITs is a Consortium approach to get affordable content in the form of digital libarary to most of the less-endowed Institutions across the country, once again levelling the field for students studying in remote areas of the country.

IIIT-B (IIIT Bangalore)

- Individual laptop to every student from Day 1
  Through an unusual combination of timing (Year 1999), location (Bangalore), context (a next generation institute, in its very first year and COMPAQ deciding to give significant discount), IIIT-Bangalore could provide individual laptop computer to each one of its MTech student. While the Institute had to invest and re-use the laptop in the first couple of years, the prices became so affordable that IIIT-B could buy and give away (recover the cost over four semesters) in the subsequent years. By the year 2007, laptops were so affordable that all incoming students had a laptop and it became a non-issue. Interestingly, by 2004 the trend caught on with many institutes and currently, it is the order of the day.
- Wi-Fi use
  Looking at the promise of wireless access and high speed Internet, IIIT-B invested in Wi-Fi (shared by 10 computers in the library) way back in 1999, in the rented premise of ITPL (with $ 700 per network card it was very expensive then). Subsequently, in its new campus, in 2003 (thanks to its compact 10-acre campus), IIIT-B could usher in campus-wide Wi-Fi connectivity. Over the years, IIIT-B could continue its leadership through high-speed Wi-Fi. Once again it became a trend, starting with ISB in Hyderabad and Welingkar in Mumbai. Today, it is standard practice in most campuses.

ISB (Indian School of Business)

- ISB is a pioneer in business education in India. ISB is one of the first B Schools to bet on Wi-Fi across the campus. With its emphasis on group projects, group discussion and informal interaction on round the clock basis, Wi-Fi access made a lot of sense. Once again, practically every B School in India today emulates the technology adoption pioneered by ISB.

Key Trends and Recommendations

The five key trends I see in Internet usage and adoption in India include:

a. Mobile Internet will dominate Internet access, which will have a far greater impact than PC-centric Internet that dominates Internet usage today.
b. India-specific content and Indian language content will increase dramatically.
c. e-governance will be widespread and Citizen – Government interface will be mainly through the Net.
d. Mobile banking and mobile trading will be the trend; it will be a way to ensure financial inclusion.
e. Education and healthcare, both in reach and quality, will be influenced significantly by the next wave of mobile Internet.

My key recommendations to the policy planners and educational administrators are as follows:

a. Invest in public sector education and healthcare significantly and use technology to leverage full utilization.
b. Enable private sector to provide access to Internet (both wired and wireless) to all sections of the society through inclusive policy and incentives.
c. Build transparent policy framework so that content, access and services provide level playing field for providers and consumers.
d. Net will be the single most useful investment in educational & research institutions. One needs to take an invest & benefit approach than mere cost justification.
e. Continue the policy of openness and desist from excessive control over the Net, including taxation; "fresh air" is the best policy for long term health of any economy.

Way Forward

The next five years will be very decisive when Internet will practically reach every Indian. With large sections of the Indian society looking at education as the primary means of social mobility, technology will play a significant role in shaping education delivery, access, management and content creation. A visit to a modern university campus in 70's and a follow on visit today will surprise any casual visitor – class rooms, libraries, laboratories and campus living have all changed significantly; a similar transformation will happen in the next 5 to 10 years, in India. It will be interesting to watch the developments as they unfold.

References

[1] *ERNET (Education & Research Net) Project http://www.eis.ernet.in/aboutus.htm*
[2] *Wikipedia on VSNL*
[3] *IRCTC (Indian Railway Catering & Tourism Corporation) http://www.irctc.co.in/*
[4] *RedBus (http://www.redbus.in/)*
[5] *UID Authority of India (http://uidai.gov.in/)*
[6] *TRAI (Telecom Regulatory Authority of India) Press Releasehttp://www.trai.gov.in/WriteReadData/trai/upload/PressReleases/767/August_Press_release.pdf*
[7] *CIA Factbook https://www.cia.gov/library/publications/the-world-factbook/*
[8] *NPTEL (National Program on Technology-enabled Learning) on YouTube http://www.youtube.com/iit*
[9] *OpenCourseWare Consortium http://www.ocwconsortium.org/*
[10] *10 Learning Management Systems http://en.wikipedia.org/wiki/Learning_management_system*
[11] *BackBoard commercial LMS http://www.blackboard.com/*
[12] *Moodle OpenSource LMS http://moodle.org/*
[13] *ETS Web-site http://www.ets.org/*
[14] *MeritTrac Web-site http://www.merittrac.com/webpages/*
[15] *T4E (Technolgy for Education Conference) http://www.iiitb.ac.in/t4e/*
[16] *INDEST (Indian National Digital Library in Engineering, Sciences & Technology) http://paniit.iitd.ac.in/indest/*
[17] *iLab Project at MIT http://ilab.mit.edu/*

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Chapter 14

Amir Ullah Khan

India's Transition to a Knowledge Economy

The Internet and its Importance in Education and Skill Development

Editor's Note

Many graduates today lack the 'essential skill' requirements for entry-level occupations. Employers are now describing their needs not just in terms of specific occupational skills but generic skills as well - communication, teamwork, problem-solving. Lifelong learning has to be provided via apprenticeship, vocational training, youth development, technology-enabled learning, and community service. What is required now is a Herculean effort by the public and the private sectors to ensure that India's growth story is not hindered in any way. India's youth today, is the first generation to have grown up with the Internet and as a consequence they have a lot to offer in terms of energy, enthusiasm, and above all the expertise to help bridge the digital divide. What Internet offers is a huge advantage to an emerging economy with scarce resources and a large constituency.

There is indeed a close correlation between economic growth and employment growth with a higher elasticity of employment. Today, the growing middle class has more disposable income and is more sophisticated. This class now requires more services and conveniences. It is increasing its spending in private sector schooling and therefore there is a crunch on the education sector what with teacher shortages at all levels, especially in the public sector. An emerging economy requires new skills and the training curricula. This requires a new syllabus, trainers who can teach these new skills, and the infrastructure where people can be trained. Skill development is the most essential requirement for a growing knowledge economy that India hopes to be. There is a huge growth in private sector schools while private high quality degree granting institutions are yet awaited. A demand-driven vocational training, a need to align education for the new economy is negated by a high premium still on government jobs, an aversion to blue collar jobs, skill shortages that are often culturally driven e.g. nursing, serving, cultural immobility, gender discrimination and an aversion to rural work. Given the lack of physical infrastructure[1], it is imperative India uses the Internet, given the connectivity available.

India's competitive advantage today clearly lies in the strengths of its human capital. The entire world envies the intellectual congregation that we have at Bangalore – a vast pool of brilliant workforce in Information Technology, Research and Development, and Biotechnology and Pharmaceuticals. India has established one of the finest education systems in the developing world. Some of India's leading educational institutions are at par with educational institutions in the developed world. The Indian Institutes of Technology (IITs), the Indian Institutes of Management (IIMs), Indian Institute of Science (IIS), the Indian Institute of Information Technology (IIIT), Indian Statistical Institute (ISI), the Institute of Rural Management (IRMA) and multitude of research institutions like the Centre for Science and Industrial Research (CSIR), Indian Council of Agriculture Research (IARI), Indian Space Research Organisation (ISRO), Defence Research Development Organisation (DRDO) and Bhabha Atomic Research Centre (BARC) are some of the finest institutions in the world in terms of their intellectual capital.

India has over 380 universities with more than 11,000 colleges spread across the length and breadth of the country. There are 1500 research institutions in the country doing research in varied spheres like science and technology, economics, and developmental issues. Every year India produces more than 200,000 engineering graduates, 300,000 post graduates from non-engineering colleges, 2,100,000 other graduates and 9,000 doctorates (PhD). The knowledge workforce in the software industry has increased from around 56,000 in 1990-91 to over 3 million by the year 2009-10[2].

The demand for employment in India in the year 2011 is estimated to grow to 380 million. Most of this demand will be for youth equipped with technical and soft skills. It will require training in flexible and varied skills like critical thinking, teamwork, multi-lingual abilities and customer orientation. However, according to the Planning Commission, there are 460 million in the workforce, 60 per cent of whom are between the ages 15 to 30, but their training is characterised by rote learning, a hierarchical structure, focus on one skill, one language and a rigid and inflexible attitude. The numbers say it all – a billion plus population with unemployment at 9.1 per cent - 42 million people, and by 2012 will grow to 65 million unemployed. 90 per cent of the workforce is in the unorganised sector and 30 per cent, meaning 140 million casual labour with no regular source of work or income. 2.8 million graduates pass out of colleges each year without skills connecting to employment. The workforce now has over 70 per cent of the labour force combined (organised and unorganized sector) that is illiterate or educated below the primary level. The labour force participation is a low 460 million of a 1 billion population[3].

The Demographic Dividend

The demographic dividend is the advantage that the Indian economy is reaping (or going to reap) due to the change in the population structure. Estimates by the Planning Commission show a rising share of the working age population (15 to 59 years) over the long-term and a relative decline in the dependent age-groups (0 to 14 and, 60 and above). This clearly has implications in terms of creation of a large pool of labour that can support industrial growth without putting excessive pressure on wages. A larger share of wage earners in the population also means a higher demand for consumer goods and services. This will support growth in these sectors.

India's median age is around 24, compared to 38 for Europe and 41 for Japan; for China the median age is 30. India in 2025 will have a dependency ratio of 12.1, i.e., for every 100 working age adults there will be slightly more than 12 persons who are above the age of 65. For China the ratio will be 19.4, for Japan 49, for Europe 33.2. In India, 5.06 per cent of the youth are single skill vocationally trained compared to 95.86 in Korea. In Botswana, this figure is 22.42, in Colombia 28.06, in Mexico 27.58 and in Mauritius it is 36.08. There are 5114 vocational schools (ITI's), covering 98 vocations. The duration of these courses is between 1 and half to 3 years. The eligibility for entry is between class 8th to 12th. The ITIs present a sad story - 1893 are run by the government with 4 lakh students, 3218 are with the private sector and have 3.46 lakh students. A changing economy requires new skills and the training curricula. This requires a new syllabus, trainers who can teach these new skills, and the infrastructure where people can be trained[4].

Age-group	2001	2006	2011	2016
0-14 years (%)	35.60	32.50	29.70	27.10
15-59 years (%)	58.20	60.40	62.50	64.00
60+ years (%)	6.30	7.10	7.90	8.90
Population (Million)	1,027.00	1,113.70	1,1194.40	1,267.50

Source: Planning Commission of India

Demographic Profile of India

It is the young population of a country that becomes the workforce for tomorrow. India has this unique window of opportunity of reaping the labour advantages of young workforce, provided two critical challenges are well taken care-of. First, there needs to be a rapid expansion in the capacities in the manufacturing and services sector because the economy needs to create massive employment avenues for this young population. Second, education and skills have to be imparted to this vast pool of young workforce in order to enable them to seek gainful employment[5].

Information Technology (IT and ITES)

Much of the change in the world's perception and outlook about India can be attributed to India's stellar performance in the information technology (IT) and information technology enables services (ITES) sectors. India is recognised globally as a powerhouse of talent and skills for information technology. Major global giants like Microsoft, Dell, IBM, Oracle, SAP, Cisco, and Intel to name a few look at India as a major strategic market for their businesses and investments. A number of Indian companies have become major global players in the IT sector. Tata Consultancy Services (TCS), Infosys, Wipro, and HCL Technologies are some of the Indian IT firms that are globally competitive and world-renowned. The Indian information technology sector has experienced explosive growth in the last 5 years. As per estimates of NASSCOM, the Indian IT sector has been growing at a rate of more than 46 per cent since the beginning of the new millennium. The World Bank rates India as the world's leading offshore development centre for IT.

E-governance is an area that has real potential with state governments committed to increasing their spending on IT (to meet the centrally imposed of target of 3 per cent of the budget) and formulating their own IT policies. There are initiatives by the government and the civil society organisation to popularise the use of IT in rural areas through e-governance initiatives. The Information Kerala Mission is a unique example of the government extending IT and IT services to a vast majority of people in the rural hinterlands. The Gyandoot education initiative in Madhya Pradesh and the TARAhaat[6] initiative of the NGO called Development Alternatives (DA) are also commendable ventures of using the Internet for the benefit of the rural people. ITC's e-choupal is also a classic example of Internet use by an agri-business firm to streamline the supply-chain and at the same time making IT accessible to the rural farmers for social and development purposes[7].

It is now universally accepted that people with adequate education and skills training are more capable of adopting new technology and become more productive than people with just basic knowledge. A livelihood can be made sustainable, when a person can cope with or recover from stress and shocks and maintain or enhance his assets and capabilities, whilst not undermining the natural base. According to the International Labour Organization (ILO), decent work means productive work in which rights are protected and which generates an adequate income with social protection. VET (Vocational Education and Training) has enabled people to expand the range of activities that they can engage in and earn a 'decent and comfortable' living. It can help to reduce economic disparities, empower disadvantaged and marginalised groups, reduce unemployment, and build social order. It increases productivity, empowers individuals to become self-reliant, and stimulates entrepreneurship. Developing knowledge, skills and attitudes (KSA) through VET for utilisation and management of natural resources for sustainable production of goods can eventually lead to achieving economic and environmental development goals[8].

Pratham, an NGO working on education discusses its experience of donating computers to municipal schools in Bombay, which were used for playing games instead of education. The only requirement for running this operation was a high level of maintenance of software while that for hardware was minimal. In the evening, the same computers were used to train community youth, which helped the people running them to earn a living, hence making the model sustainable. But this model did not last long due to increased private sector competition in computer education as well as the old computer hardware not being upgraded.

The Internet is used in the field of enhancing creativity of students by fostering self-learning. In this model, the teacher is just a facilitator in the learning process. Such a model has not percolated down to the middle and poor income group schools because of minimal usage of computers. Another problem is that the software being used in education is transplanted from outside and not developed within the country to cater to our local peculiarities. Yet another issue is why the examination system in India can't be revamped so that students get a second shot at the same examination to improve their scores. Here, the Internet and computers could be of help, similar to the way the American examinations are administered. It is important that we change the way the archaic system controls the dissemination of knowledge in our country as there is a conflict between it and the user – the latter being modern and intelligent while the former still stuck in a time warp. To bridge this gap, the Internet has been an important tool. A new way of thinking is required to tackle the problems of delivering education and one solution could be the breaking of the conventional school into three compartments on the lines of physical activity, learning and social interaction.

There are 4877 vocational schools, or what are known as ITIs in India; 1863 are run by the government and 3014 are with the private sector. A changing economy requires new skills and the training curricula in these schools needs to be upgraded. This requires a new syllabus, trainers who can teach these new skills, and the infrastructure where people can be trained. However, even then, the number of students the current vocational schools can train in any year is not sufficient, given the large expected inflow of people into the labour force. Therefore, in addition to upgrading the current ITIs, we need to increase the supply of training centres.

Unemployment is high across the country and particularly for the huge youth population. Young men and women between the ages of 15 and 24 years represent almost one-fifth of the world's population, and in Asia and the Near East, they make up the fastest growing segment of the population. Compared to adults, the youth of today are more than three times as likely to be unemployed. Youth are one of the region's greatest assets for the present and future. Yet they are a group with vulnerabilities. In recent years, increasing global unemployment has hit young people hard, and today's youth are faced with high levels of economic and social uncertainty[9].

Unemployment and under-employment also impose heavy costs on society. These costs include social instability, a shrinking tax base, higher social welfare costs, and loss of production in society. Unemployment is due in part to an imbalance between supply and demand for jobs as well as poor coordination between the education and employment sectors. Many studies confirm that education and economic growth are mutually inter-dependent. A prosperous economy provides countries with much needed resources to strengthen and expand existing school facilities, and a solid education system helps to generate the capacities and talents to stimulate and sustain economic growth. Development organisations as well as national policymakers are increasingly concerned with how job skills—literacy, numeracy, basic knowledge, and ICT skills —translate into employment and serve as an enabling tool for improvement in other sectors. Simply increasing the level of schooling of the general population does not necessarily lead to a booming economy. Thus, future workforce development programs need to focus on what is being taught in schools and other institutions and how these skills connect to other sectors such as the economy, health, and the environment. Above all, creativity, innovation, and ingenuity must be fostered and rewarded.

A demand-driven workforce development system is made up of the public and private sector policies and programs that help people acquire the knowledge and skills needed to earn a living whether by means of self-employment or by working for someone else in the formal or informal sector of the economy. It includes policies and programs that help employers get and maintain a skilled workforce. Unlike separate programs that operate in an uncoordinated and therefore static manner, a demand-driven workforce development system is flexible and able to adapt quickly to changing economic conditions. It is characterised by on-going communication and continual feedback among employers, workers, educators, and government. In addition, it is critical to create the policy environment, infrastructure[10] and financing system that is conducive to broad-based economic growth that is necessary to generate the demand for employment.

Workforce capability can be defined as the level of knowledge, skills, and process abilities available for performing an organisation's business activities. The ability to think creatively, make decisions, solve problems, visualise, analyse, interpret, etc., - these skills are most often mentioned in definition of critical thinking. These skills are not only critical to work; they are also needed to deal with the increasingly complex spheres of family, community, and society. Higher order thinking skills are also essential and must be provided to meet the challenges in knowledge economy.

Although occupational or specific skills play an important role, it is now being increasingly felt that special attention should be given to basic skills such as literacy, communication, and numeracy. Training in specific skills is more effective when it builds on a strong foundation of general education. Most graduates lack the 'essential skill' requirements for entry-level occupations. Employability skills are the generic skills, attitudes and behaviours that employers look for in new recruits and that they develop through training programmes for current employees. Employers are now describing their needs less in terms of specific occupational skills and more in terms of generic skills - communication, teamwork, problem-solving, etc., that help ensure a flexible and adaptable workforce. In modern manufacturing and services sector, in which the conceptual content of jobs is increasingly high and manual skills are becoming correspondingly less important. The broad competencies gained through good quality academic secondary education are significant, not only to enhance productivity, but also to the ability of workers to learn new skills throughout life. The most important of these are the abilities to communicate clearly in writing and to use mathematics and science skills to diagnose and solve problems[11].

Workforce Development

Workforce development systems bridge the traditionally separate policy domains of education, labour and economic development. The Confederation of Indian Industry has been focusing private sector and government attention on skill development. It has identified the key components of a demand-driven workforce development system which include:

- A formal education system that produces graduates with knowledge and skills relevant to market demand
- Diverse opportunities for lifelong learning by youth and adults with different needs outside the formal education system in workplaces, adult literacy, apprenticeship, vocational training, youth development, technology-enabled learning, community service and other "alternative" programs
- Financing strategies and incentives that support sustained public and private sector investment in skill development
- Labour market/economic growth policies that foster economic growth with a high employment component
- Strategic linkages among employers, unions, educators, government, non-governmental organisations, and individual citizens in the labour market to promote system responsiveness to economic needs, continuous improvement and results-based accountability
- Labour market information, job placement, employment retention, and work support services that increase access to employment and meet the needs of workers and employers- the system's dual customers
- Strategies for certifying knowledge and skills gained outside the formal education system that are recognised by employers and build pathways for continued learning in the informal and formal learning systems
- Literacy and numeracy, alongside core workforce skills (e.g., ability to use technology, communication, creativity, initiative, teamwork, learning to learn, etc.), constitute basic skills that are fundamental for working life
- The gap between completion of initial basic education and training, and entry into employment has tended to lengthen; those who find work tend to spend more time in temporary, insecure jobs.
- Many young people fail to find jobs on completing their education and/or training, even when they have gone relatively far in the educational system (the educated unemployed)

because of the mismatch of their skills with labour market requirements, and because of the poor quality of their education
- Lack of opportunities for work experience, combined with the absence of adequate labour market information, vocational guidance and counseling , poor job placement mechanisms and inadequate demand exacerbate the problem of getting a decent job
- Discrimination, economic hardship, gender, and access issues impact some young people more than others
- It is important to include the informal sector in extending activities and opportunities for youth, emphasising an improvement in informal sector working conditions and benefits. Case studies of promising programs can inform the selection of activities to be included
- Most of the world's youth work in the informal economy, both in rural and in urban areas. They lack adequate incomes, social protection, security and representation
- Opportunities for advancement within the workplace create more jobs for new entrants

Conclusions

What is required now is a Herculean effort by the public and the private sector to ensure that India's growth story does not end. With a large workforce and the need for training, it is important to work out a strategy that will ensure India's preeminent status in the knowledge economy. A few suggestions that emerge are:

- Remove excessive constraints and regulations for setting up private institutions – establish transparent procedures and legislative framework (e.g., Czech Republic, Indonesia)
- Government support
- Supporting Corporate Social Responsibility (CSR)
- Assist secondary system to train trainers and develop new curricula
- Assist spread of community polytechnics and colleges
- Train the trainers and capacity building
- New management paradigm of ITIs and Polytechnics
- High-speed teacher certificate program for trades practitioners
- Use / develop new teaching methodologies
- Support Internet bases competency-based training and certification systems
- Support access to basic information and understanding of rights for vulnerable youth – particularly rural youth and migrants through the net
- Encourage rural bankers and finance instruments projects

India is an exciting economy today. It is also a very young country populated by youngsters. The buzz in the air is that the 21st century belongs to China and India. India particularly seems to be well situated because of its structural advantages. The young population with its energy and consumption orientation and higher savings, a rapidly expanding labour force and a set of institutions that have now matured through some experiments in indigenous democratic strengths that has evolved into a unique political economy today[12]. However, despite being this huge and growing demographic stratum, young people have too often been seen as a burden rather than an asset, a group to be taught but not to teach, and to receive but not to give. Developments in Internet are dramatically changing this paradigm. After all, young people, the first generation to have grown up with the Internet, have a lot to offer-energy, enthusiasm, and above all the expertise to help bridge the digital divide.

What Internet offers is a huge advantage to an emerging economy with scarce resources and a large constituency. It is indeed the knowledge economy that enables the maximum utilisation of available factors of production, especially where labour as an input is abundantly available. The state of Internet knowledge affects the success rate of turning potential new ideas into practical ones. It enables more effective storage, processing and communication of knowledge. Internet is not just Internet and computers, it also includes writing and telephones, and that is what makes Internet a special policy tool and where physical transport is costly because of all factors related to availability of roads and vehicles, modern communications offer a most efficient alternative, especially in poor countries.

Therefore, if some governments do not invest in Internet intensively, it must be because of constraints that prevent them from adopting the best available technology. The major barriers to Internet use are opposition from various vested interests unions, irregular power supply, and lack of skilled personnel, in that order. Internet usage impacts the economy and brings about a new manner in which work gets done in particularly the development sector. As has been seen across the world, there are huge costs associated with market or government transactions. And ironically, it is the less developed countries have relatively high transaction costs . It is important to note that governance structures and the manner in which they use Internet could utilise technology could streamline activity and increase productivity. While IT helps individuals in an overall sense, it is possible to bring about organisational changes that completely recast the way operations are handled within the society. Not only does this improve governance and productivity, it also changes the organisation of people and skills. Penetration across departments and sectors results in networking advantages. The benefits of using Internet show up only after there is a critical mass of firms and units that get computerised. Therefore, some constituents will wait for this critical mass before they spend on Internet infrastructure. It is here that the government can play a very positive role in overcoming this sluggishness in the adoption of Internet. If most government dealings are through the use of Internet, people get an immediate benefit of using Internet themselves and are encouraged to invest regardless of whether others are doing it or not.

The knowledge economy of today's digital world offers tremendous opportunities for youth and is accompanied by some serious challenges. On one hand, the digital age enables innovation and capacity building with real time price discovery. On the other hand, it severely handicaps those not included in the knowledge economy. To bring about inclusion and to bridge the digital divide, it is imperative that policy making allows for capacity building through innovative education, leveraging public private partnerships and educational institutions. This will channelise youth energy into a productive, efficient and dynamic society. IT is not a way of doing business, as yet, in India. The irony is that management, clerical and marketing employees have greater access to computers and Internet than skilled workers. However, the Internet often acts as a substitute for lack of resources and direct connectivity to markets. Using Internet affects positively the performance indicators of the firms and institutions that do invest in IT. Greater Internet use is associated with better performance and institutions that use Internet earn higher profits, employ more people, lower transaction costs and reach out to many more people that those which don't.

References

[1] *In India, the three things required for using Internet in education have always been the device, connectivity and content. The debate in hardware is between state of the art and bottoms-up approach and asks the audience to look beyond computers to access the Internet. In connectivity a lot has been done, in technology terms, but the critical issue is applications that run on this infrastructure. There are a plethora of successful cases of IT deployment to meet the social needs and it is time to scale these models. Thus the available concepts need only to be taken to the market by industry to fully exploit these development models.*

[2] *India would continue to be surplus in working population for a long period of time, and as per the estimates of Morgan Stanley, India would contribute 25 per cent to the additional working population globally for the next 5 to 7 years. The World Economic Forum's Global Competitiveness Report (2004) ranked India 3rd among 102 countries in availability of scientists and engineers, 8th in the quality of management schools, 20th in the quality of scientific research institutions and 36th in the quality of the overall education system.*

[3] *Organised employment has been stagnant at 30 million for thirty years (22 million in Public Sector, 8 million in Private Sector). Given that more than 250 million people are below the poverty line, even the majority of those employed can barely sustain themselves. Given India's employment elasticity (0.15) and ICOR (3.75), the 8 million new jobs needed to freeze unemployment require an impossible annual GDP growth rate of 13.6 per cent and investments of US$125 billion.*

[4] *Unskilled labour has to be skilled. This requires trainers and training infrastructure. Second, their skill has to be recognised and accepted by the potential employers. This requires credible certification of the skills acquired by labour. An added advantage of certification is that labour markets become integrated. It does not matter where the labour has been trained, or resides. It can always move, if it wants, to where it gets the highest wage.*

[5] *India's demographic advantage is all the more pronounced when compared with the demographic profiles of other nations of the world. Compared to the countries in Europe, India has a distinctly younger population. For instance, in 2025, while the median age in India would be around 31.3 years, it would be 50.7 years in Italy, 49.2 years in Spain and 48.5 years in Germany! Even in 2050, India's median age would be less than 40 years. Thus, for the medium to long term, India has an assured supply of young manpower to work in her manufacturing units and service centres without putting too much upward pressures on wages.*

[6] *TARAhaat (Technology Action for Rural Advancements) is focused on using technology for providing sustainable livelihoods in villages. The strategy deployed is to evolve a commercially viable ICT-based enterprise and to deliver public benefits by satisfying private needs. The services provided are education, e-governance, insurance, mini-credit financing, rolling out development packages made by NGOs and e-communications. TARAhaat has created manuals for running the business from scratch, as there were no existing systems to replicate, so that the local population can be trained to make the initiatives self-sustaining. The bulk of the revenue goes to the franchisee with TARAhaat just being the centre of the infrastructure ring. The organisation also collects a huge amount of data on rural consumers and this information might be attractive for corporate houses as they foray into rural markets.*

[7] *The lowest tier population in rural India gets caught in the vicious circle of low income and low expenditure, which makes it a challenge to serve them. There are about five intermediaries between the farmer and the market where he sells his produce. They block information flow and profit from the arbitrage opportunities such situations provides but they also play an important role in replacing infrastructure. To overcome this and to improve farm income, the e-choupal initiative provides end-to-end solutions wherein the intermediary is used as a catalyst to reach out to the small farmer but bereft of the advantages of restrictive information flows. The farmer can make informed transaction decisions by using the ICT infrastructure that e-choupal have set up in certain states of India. Since most of the trade is in commodities the margins in the business are low. By directly reaching out to the small farmer there are significant savings in cost for the company as well as the farmer getting a higher price for his produce. ITC has also been able to segregate the different grades of commodity at the time of collection itself, reinforcing its ability to sell dissimilar quality products for which it is able to charge differential rates.*

[8] *The MS Swaminathan Research Foundation runs the Information Village Research Project in Pondicherry.*

The basic idea behind this effort was to expand the reach of Internet to the people who did not have access to it. The information that is required is seen from a local geographic perspective and is provided by using IT tools. Their baseline study showed that the information linkages in the informal sector were much stronger that the linkages between the formal sectors and therefore efforts were made to improve the latter by providing more information to citizens. The approach is to provide services that are demand driven as opposed to supply driven by providing those services that are required by the locals and can be easily accessed i.e., all the databases are available in local languages. The Foundation argues for a cost-effective delivery system and replicable model so that information flows become smoother. It also wants to widen the definition of ICT by bringing community radio, television and newspaper into its fold. It is important to note a caveat that blindly following best practices from elsewhere could be dangerous instead suggesting specific local content and applications are being more important for success.

[9] *By 2015, the number of youth (15-24 years of age) looking for work in South Asia is expected to grow by 22 million, or 48 per cent of the total growth in numbers of youth looking for work (45.4 million). In Southeast Asia and the Middle East/North Africa, the numbers will grow by 2.6 million and 3.3 million, respectively (six and seven per cent, respectively). When unemployed or otherwise marginalised, youth can become easy targets for extremist recruitment efforts. The inability to find a job creates a sense of vulnerability, uselessness and idleness among young people. It can heighten the attraction for illegal and destructive activities, including child labour and trafficking. For many young people, being without work means being without a chance to escape poverty.*

[10] *The Gramdoot program in Jaipur district of Rajasthan is based on fibre optic technology that was laid out all through the district to carry voice, data and graphics all over the network. A central head-end is established where there is an Internet gateway, a cable television head-end, a wide area network server and an IP call manager so that the 100 mbps wide area network can be served television channels, online learning, access to non dial-up real time net and telephony services. The central hub is the district headquarters, which is connected to all the villages, from where further access to individual households is provided. All government records are online - from land records to revenue collected – and health and education services are provided real time in Jaipur district. To help sustain this model commercially a small charge is administered for the services provided.*

[11] *Technological change is expanding the cognitive and theoretical knowledge required for productivity in skilled occupations, thus increasing the need for workers to have a foundation of basic competencies to make retraining effective. Skill training should, therefore, involve development of personal and social competencies (e.g., self-management, time management, stress management, networking, negotiating, etc).*

[12] *A new class is emerging banking on dynamism and entrepreneurial ability, the trade sector getting prominence and a strong media that is applying the kind of pressure on the political class that is undeniable. The demographic transition must reap its dividends if all this is nurtured. If not, it could lead to chaos and disorder and civil strife the beginnings of which we already see in Naxal affected districts in the infamous red corridor.*

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Chapter 15

Ganesh Natarajan

Impact of the Internet on Skills & Education in India

Editor's Note

Addressing the impact of the Internet on skills and education in India, this chapter identifies two key mistakes made after India's independence: the separation of research and academic institutions, and the separation of skills development and education. India has 587 million people below the median age of 25 years. Over 12 million people are added to the 500 million plus labour force annually but only 10 per cent of our industrial workforce is skilled; less than 40 per cent of graduates are found to be employable by industry and need further training. This chapter advocates the importance of "Roti, Kapda, Makaan, Bijli and Bandwidth" for India. Built on three fundamental precepts – a learner centric model of education, employable and contemporary skills and conceptual grounding in the subject area that is being covered – and built on an Internet backbone, the chapter proposes an Open Learning environment and an Innovation University for India.

From being home to temples of learning like Nalanda in ancient times, Indian education system is suffering due to historic blunders made after independence. The challenges before us are many and government initiatives are turning out be too slow. The availability of technology and internet gives us new opportunities to transform our skills and education systems. The technology-enabled learning sector with an array of e-learning tools is moving towards "online learning". The rapid evolution and spread of Internet is providing new opportnties to players in the education industry and smaller towns and rural India have also started benefiting through various access points. Key Barriers remain and remedial solutions lie in developing new technology-enabled learner centric models to facilitate new-age colleges and universities

The Skills & Education Scenario in India

India has a strong tradition of education. From the early days of the Vedas and the Upanishads, the Guru discoursing to a respectful group of students has been the format in which learning was passed on from generation to generation. Institutions like Nalanda which flourished as temples of learning centuries ago are revered even today and a recent government move to approve a multi billion dollar revival plan for a new Nalanda University epitomises the importance generations of Indians have given to building educated families and communities.

Sadly, as modern post independence India has emerged and the "temples of modern India" shifted to the Nehruvian model of dams and industrial establishments, one historic mistake was committed in the separation of research and academic institutions. In recent years a second significant mistake has been committed which is the separation of skills development and education, at the ground level, in academic institutions and even at the government level where the skills development imperative is seen as a responsibility of the Ministry of Labour while the Ministry of HRD focuses on education in the traditional sense, in schools, colleges and institutions of higher learning. The intentions of each of these segregations have been noble. In theory, separate focus on research by the Ministry of Science & Technology, education by the Ministry of HRD and skills by the Ministry of Labour could have enabled a strong workforce to be created for industrial establishments, well educated professionals emerging for white collar, supervisory and civil services jobs and a reflective scientific community to provide thought leadership for new innovations and innovations to power the country forward.

What has happened – in India and the world, for this attempted segregation to become meaningless and almost anachronistic? For one, global trends have moved away from such clear segregation of research, education and skills. In many industry segments, particularly the services sector, there are no longer fine distinctions between basic skills, white collar and managerial roles and deep research. In the outsourcing industry, which has become the pride and joy of India and an aspirational industry for young people in the country, an entrant with basic skills in accounting or technology or even just telephone communications can go on to become a team leader and then a program manager or process migration specialist and develop the capabilities to optimise the process or build innovative new solutions to complex customer problems. This has facilitated young people entering the workplace at an early age and given them the opportunity to work their way up to the top.

The opportunities and challenges in our country are both substantial. Our demographic potential is immense with 587 million people below the median age of 25 years. Over 12 million people are added to the 500 million plus labour force annually but only 10 per cent of our industrial workforce is skilled in comparison to 85 per cent in South East Asian countries. Of the 3 million plus graduates and 1 million who go through vocational training centres, less than 40 per cent of the graduates and above are found to be employable with NASSCOM reporting an even lower percentage of employability in graduating engineers. In the vocational streams, a survey by National Skills Development Corporation (NSDC) found severe skill gaps in technical as well as soft skills, a sorry reflection on the state of skills development as well as education in the country.

The Modular Employability Scheme which was launched with much expectation and embraced by vocational training institutes and industry bodies alike has been floundering because of a lack of clarity on the jobs available to the output of these programs. On the other hand, multiple colleges and universities that dot the landscape of the nation today provide diplomas and degrees that are not worth the paper they are printed on – a clear case of neither skills development nor educational institutions serving the purpose of either generating knowledge or employability. And on the research side, after years of doctoral research being pursued only by academics or individuals who did not have the confidence to enter the corporate world, it is only recently that quality professionals are enrolling for PhD programs because of significant outsourced research that is now happening in India.

The Government is also concerned at the enrolment ratio in colleges, and the new target of achieving a 15 per cent GER (Gross Enrollment Ratio) by 2012 will need a 3 million increase in enrolment in the next couple of years and hundreds of new universities and colleges. A government plan does exist for creating 30 new central universities, 8 new IITs, 20 NITs, 20 IIITs, 7 IIMs and over 500 new community colleges and polytechnics in districts with below average GERs. But the abysmal teaching quality will be a deterrent even if new physical capacity is created. There are government initiatives in place for fiscal incentives to the private sector, and the NSDC itself has been set up in partnership with the private sector -- but all this is proving to be too little too late.

The country today is faced with two significant challenges. First, how does a system emerge where a person located even in the most rural area can acquire the primary skills and certification to get started as a wage earner. Second, how can a model emerge where skills learnt through courses and further enhanced on the job can be accredited to enable the individual to move into a formal education process and work his or her way up to bachelor's master's and even doctoral degrees over a period of time. This is the twin challenge of building laddered qualifications and there is an even bigger challenge of enabling scaling of learning processes without any drop in quality. The availability of technology to build new skills and education systems and enable learning processes to be completely transformed is the area of exploration for this chapter.

The Rise and Fall of Technology in Learning

Technology in education is dismissed by many in the country by referring to some early failed experiments in e-learning where neither the design nor the delivery had been customised to the audience or the capabilities and limitations of the medium being used. Technology has progressed substantially in the last decade or so and the cost-effective availability of tools like CISCO's Webex, videoconferencing, and electronic whiteboards has enabled blended learning models to evolve, where the entire cycle of prerequisite, core, remedial and reinforcement learning is designed around expert availability in synchronous but distributed classroom sessions while commonplace concepts are delivered through asynchronous "just in time" learning models.

My own early experiences with e-Learning started in the late eighties when NIIT had tied up with Applied Learning International to bring automated learning systems to the country. This was before the Internet had arrived and hence there were learning workstations where a combination of computer based training tutors and interactive video was available for self-learning. I recall spending an amazing morning at Chiswick in London at their studios playing with the technology and learning how to conduct a meeting through some fascinating simulations – a learning that has stuck to me for life and impressed me with the fact that when learning content is designed for a medium, it can be truly effective. Applied Learning later became NetG which was acquired by Skillsoft, one of the contemporary market leaders in the area. It is heartening to recall that we built one of the first courses for Skillsoft way back in the mid nineties.

Through the last two decades the industry has moved its terminology to describe e-learning from technology-enabled learning to embrace "online learning" and "web learning." The early problems where web learning was designed as a page turner book on the Net have been overcome and the availability of rich media and usability engineering have ensured that the learning retention from e-learning is as effective and sometimes more than that achieved in a high powered classroom.

Blended learning models have also been perfected where for each stage in the adult learning process – prerequisite to content to remedial and reinforcement learning, the appropriate choice and mix of technology delivery and live facilitation through synchronous or asynchronous modes of one to many connectivity can be used. This ensures maximised learning effectiveness and also increases completion rates for programs with measurable returns on the investment in new ways of learning.

Some trends in e-learning apart from blended learning which are important to track are as follows.

- Integrated e-Learning suites are emerging where specific business problems are addressed through a potent combination of content, technology and support services. Training on technical skills, simulations of business problems and even specific training on quality systems or dealer management can take advantage of these suites. These tools powerfully address the business problems by using the right combination of pedagogy, technology and methodology for developing the requisite skills in the learner group. Technology today enables a smooth transition from learning to knowledge management and competency development. Extensive use of collaboration, assessment, reporting and workflow tools has enabled e-learning to produce excellent learning outcomes and business results – music to the ears of HR and finance chiefs and deans of business and technology schools.
- Integration of multiple learning models in one learning environment. For example, seamless transition is now possible from classroom teaching to live group activities to self-paced learning. This facilitates expansion of learning communities from the individual to small project groups to full classrooms, without losing the predictability of outcomes. One interesting by-product of this integration is that the ubiquitous Learning Management System (LMS) has diminished in importance. The new knowledge delivery systems work internally within the firm as well as transcend corporate barriers to enable stakeholders like dealers, suppliers and even customers to work collaboratively on learning programs designed to optimise solutions discovery to complex business and cultural issues.
- Increased outsourcing of learning and learning management is also a key driver of change, since it is causing significant changes in the structure of training organisation in firms although the more traditional academic environments are still relatively unaffected by the changes. Talent shortage in key manufacturing and services sectors is compounded by the low attractiveness of training as a vocation for many young graduates. At the same time, increasing globalisation is making extensive cross-cultural training an imperative and hence the focus on talent management will become more intense in the years to come. Managed service and shared service organisations are becoming the norm across the world. These shared services organisations will all have significant investments in technology that can be leveraged for creating new learning environments.

- Integration of e-learning into the mainstream of corporate training, particularly in the US, with continuing focus on scaling volumes and increasing the quality of retention. The propagation of learning communities with participants learning from each other and sharing new knowledge through integrated learning and knowledge management systems and the focus on new media to substantially enhance the quality of the learning experience has made it an integral component of every training manager's toolkit.

The rapid evolution and spread of the Internet which will be discussed in the next section has opened up the possibilities of new-age colleges and universities also being founded on a technology enabled learning premise, which will substantially expand the learning audience beyond the smaller though very discerning corporate learners. There are many technology and usage trends in e-learning globally which will find their way into India and enable a new wave of transformation of learning processes to be unleashed in the country. Some of these are listed below.

- Content repurposing will now be a practice at the best academic institutions. After MIT's early experiments in putting e-learning materials out on the Web, all academic institutions of repute have realised that providing access to some of their courses to learners many miles away would not cannibalise their on-campus enrolments. On the contrary, the brand name awareness would increase and both formats of learning would benefit. The massive allocation in the MHRD's current budget to technology and connectivity between academic institutions of repute and the very laudable project of the IITs to put their courses on the Internet demonstrate that this trend has not missed India.
- Gaming is now becoming an integral part of e-learning and nothing explains this better than a real case study. At Zensar Technologies, we had struggled for years to ensure that every associate was trained on the core values of the organisation but the implementation was always found lacking. The introduction of a high quality video series where a young new associate wanders around the campus interacting with members of the management team made the values understanding process a little more entertaining and the crowning glory was provided by an interactive web game created on the lines of Monopoly or Trade where the participant threw virtual dice to go around the board and could make progress only by answering some questions that demonstrated the understanding of each value. Participants who have watched the video, engaged in discussions with team leaders and management on some of the value conflicts and participated in the internet game have a clear value understanding that beats many hours of classroom training, which was the only mode of values dissemination to associates in the past.
- The umbilical cord between the trainer and the learner has been literally cut with the availability of hosted learning management systems like Moodle and the ubiquitous nature of wireless access. The reach and potential of wireless dissemination of learning nuggets has not been fully realised but in a country like India where subscribers spent a decade waiting for the telephone and then another decade waiting for a dial tone, the mobile phone has transformed the access and cost of communications like no other. Experiments are already underway to enable the phone to be used as a skills learning device in a "just in time" rather than "just in case" manner. The next wave of transformation will begin with the mobile phone for sure.

To conclude this discussion on e-Learning, training managers are already integrating e-learning modules into their learning architecture and infrastructure and encouraging the use of webinars, blogs and web conferences as methods of quick access and dissemination of ideas and skills. Academia however is not unlike traditional American business schools like

Harvard and Wharton which watched the amazing growth of the online courses of the University of Phoenix for many years before finally starting experiments on their own. This is the last fort in our country that has to be taken over by the new wave and it is now a question of "when" rather than "why"! Is the digital infrastructure ready for this transformation?

The proliferation of the Internet

This section explores the evolution and proliferation of the Internet and the cost effective availability of broadband that is making rich learning applications feasible. The origins of the Internet reach back to the 1960s with both private and US military research into robust, fault-tolerant, and distributed computer networks. The funding of a new US backbone by the National Science Foundation, as well as private funding for other commercial backbones, led to worldwide participation in the development of new networking technologies, and the merger of many networks. The commercialisation of what was by then an international network in the mid 1990s resulted in its popularisation and incorporation into virtually every aspect of modern human life. As of 2009, an estimated quarter of Earth's population used the services of the Internet.

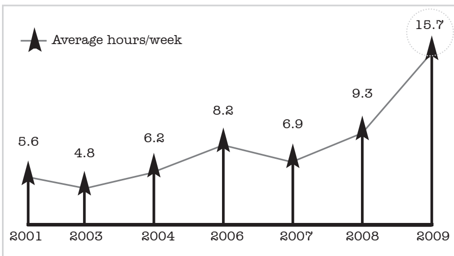
Despite the considerable popularity of the Internet in India, the ISP market was for a long time in disarray. It appears to some extent to have settled down. After a period of market rationalisation, there are now around 160 operational ISPs in the country. Despite the large number of providers, just 10 per cent of the ISPs have 90 per cent of the subscribers. In fact, 5 per cent have 88 per cent. The state-owned BSNL and MTNL continue to dominate the market, holding first and second place in terms of Internet subscribers and a massive 70 per cent of the total subscriber base. Cybercafés have certainly been playing a major role in fuelling the development of Internet in India. About half of the total Internet subscriber base finally had broadband access coming into 2010.

The statistics pertaining to growth and proliferation at the end of 2009 are quite encouraging. Some of the data and charts provided here are drawn from the research of Sadaket Malik, a visiting research fellow from the University of Philippines and a report on the e-learning industry in India, an article[1] published in the Financial Express and various blogs. Some vignettes:

- India's Internet community grew by a spectacular 42 per cent in 2009 from a year ago, spurred by a proliferation of cheaper devices and affordable broadband plans that helped sidestep snags such as stagnant PC sales and a shrinking population of cyber cafes.
- The country's Internet user population grew to 71 million last year, according to an annual survey by market research agency IMRB and Internet and Mobile Association of India.
- Four of five computer users and English-speaking persons in urban India are now regular Internet users according to a survey that was conducted among 19,000 households, 68,000 individuals and 500 cyber cafés.

The PC User population in India has increased from 72 million in 2008 to 87 million, largely attributable to the spread in the larger cities. 25 per cent of the Indian population stays in cities and with better facilities and job opportunities concentrated there, the process of urbanisation is spreading at a rapid pace. Interestingly, 32 per cent of the urban

India's Internet Usage and Population Statistics:



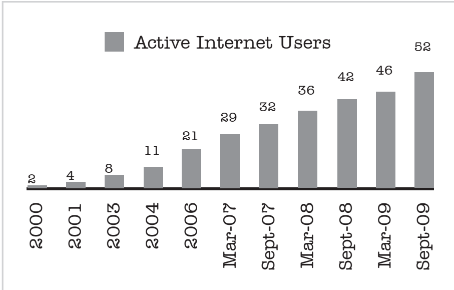
population is PC literate, of which 72 per cent claim to have used the Internet with 73 per cent of those having used the Internet in the last one month.

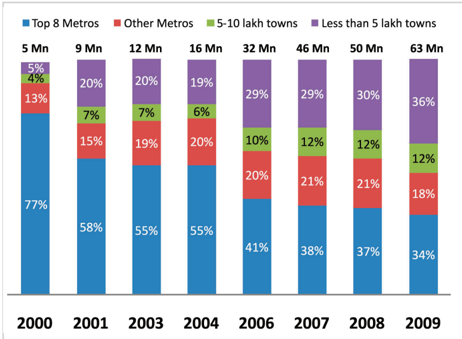
The Internet Usage in India has shown a steep 70 per cent rise, with usage going up from 9.3 hrs /week to 15.7 hrs/week, cent primarily due to more entertainment content, content delivery, and so on. 37 per cent of Internet access happens from cybercafés, followed by 30 per cent who access from offices and 23 per cent from home. Around 4 per cent browse the Net via mobile phone, and this can and should jump rapidly as access improves and access rates continue to fall from the mobile phone.

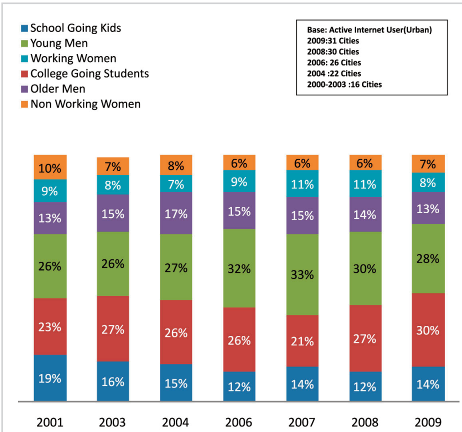
Overall, 71 million users accessed Internet in the year 2009, with 52 Million "active" users who accessed it at least once in a month. The geographical spread of Internet usage points to some clustering. Small towns contributed to only 5 per cent of Internet usage in year 2000.Over a period of 9 years, this has grown to a healthy 36 per cent and for the first time has overtaken the Internet usage in urban areas, a healthy sign for marketers targeting an all India customer base!

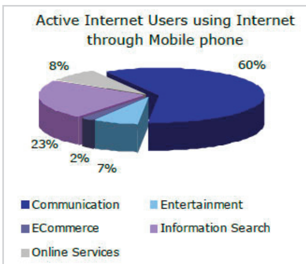
From a demographic usage viewpoint, there are no surprises to find that youth in India is getting increasingly addicted to the Internet with the older generation still relatively slow in adoption and usage. School and college students contribute to more than 44 per cent of all Internet usage that happens in India with over 72 per cent of young people accessing the Web on a regular basis.

A study by IMRB and IAMAI suggests that there are only about 2 million users accessing the Internet through their mobile phones and other mobile devices on an active basis, which means they use Internet on their Mobile at least once a month. India is riding high on the mobile revolution, but it is imperative that broadband Internet access reaches every nook and corner of India for it to really be in the forefront on Information Highway.









While there are many positive indicators regarding Internet usage in the country, there are many concern areas as well! India ranked nearly at the bottom of the rankings in a survey on connections speeds with an average connection speed of 849 kbps. India ranked even lower globally for number of unique IP addresses per capita, with 0.0030. Delhi and Maharashtra top the list with over 1 million unique IPs each. India had only 0.6 per cent of connections above 5 mbps with connections between 2 mbps and 5 mbps at 5.8 per cent, connections between 768 kbps and 2 mbps at 43.7 per cent and 26.4 per cent connections below 256 kbps. India ranked at No. 100 globally for broadband adoption, with 5.8 per cent of connections at speeds over 2 mbps, up 52 per cent year-over-year, and up 20 per cent from Q3 2009.

Internet in Rural India

While there is some evidence of the spread from urban centres to smaller towns, rural India which accounts for about 70 per cent of the total Indian population at 568 Million (as per National Readership Survey 2006) has not received the sort of attention and investment necessary for increased Internet penetration. The benefits of spreading the Internet in Indian rural villages could be multifold. By enabling rural populace to access the Web through common service centres and other envisaged access points, access to skills, education, healthcare and even government services could be enhanced, spawning entrepreneurship and leading to self-reliance and empowerment.

A survey, conducted in 7 states (Andhra Pradesh, Assam, Maharashtra, Orissa, Rajasthan, Tamil Nadu and Uttar Pradesh) among 15,000 individuals residing in villages revealed that there are 3.8 million claimed Internet users in the rural villages in these states. In these 7 states, there are 2.6 million active Internet users. At the national level, the number of claimed Internet users is 6.46 million and there are 4.18 million active Internet users. The Internet penetration for rural India has increased from 0.97 per cent in 2008 to 1.13 per cent in 2009. Rajasthan and Tamil Nadu were additional states surveyed in 2009. Of the people surveyed in Tamil Nadu and Rajasthan, there were 1.10 million and 282,000 claimed Internet users respectively. Interestingly, Tamil Nadu had a significantly high proportion of active Internet users of 89 per cent, or around 1 million such users.

With the proliferation of initiatives as e-Choupal, Shakti and so on, rural people have started using the Internet for agriculture-related aspects. About 13 per cent of the people use the Internet for knowing more about latest farming techniques and 8 per cent of the people use the Internet to find more about fertilisers and pesticides. This is an important point to note considering the importance of farming in rural India. If there are Internet related initiatives with farming as a focus, this could certainly trigger Internet literacy to rise faster. Couple this with the ability to access basic necessities like tele-medicine and Internet-enabled skills development, and the opportunities are enormous.

Key Barriers and Remedial Solutions

Having established the fact that there is a wide awareness of the Internet across the country including many addressable rural areas, the opportunities for building truly technology powered educational institutions as the "quality with scale" model for the country are immense. Key barriers today are the need for training on effective usage of the Internet and the need for infrastructural setup such as continuous availability of electricity, Internet connections or appropriate access points.

There was a time when Dewang Mehta, the first head of NASSCOM, had coined a slogan that India must treat five items as essential for every citizen: "Roti, Kapda, Makaan, Bijli and Bandwidth," and today there is a realisation that the focus on bandwidth availability in all but a few metro locations is woefully inadequate for any serious applications, particularly education and entertainment, that could be developed for the Internet. The Internet Service Providers (ISPs) who have played a key role in the expansion of the Internet community believe that broadband should be classified as key infrastructure for the country with income tax benefits available to ISPs as well as cybercafes and public access kiosk owners to help spread the Internet to places where individual PCs are unaffordable.

The list goes on – domestic and international leased line prices need to come down substantially, and ISPs should be treated as bulk customers and provided wholesale prices. A watchdog is needed to guard the ISP and the consumers against discriminatory or predatory pricing policies and practices; ISPs should be treated as bulk customers and be given wholesale prices. Clear policy frameworks need to be established to enable foreign service providers like Skype, Vonage, Novanet and Impetus to co-exist with licensed domestic players to avoid revenue leakage for the government and create a level playing field for market expansion.

The challenges are many but the fruits of the hard labour that is required to build a country-wide enabling network for free flow of information, education and entertainment can be truly sweet as we discuss in the last section that follows.

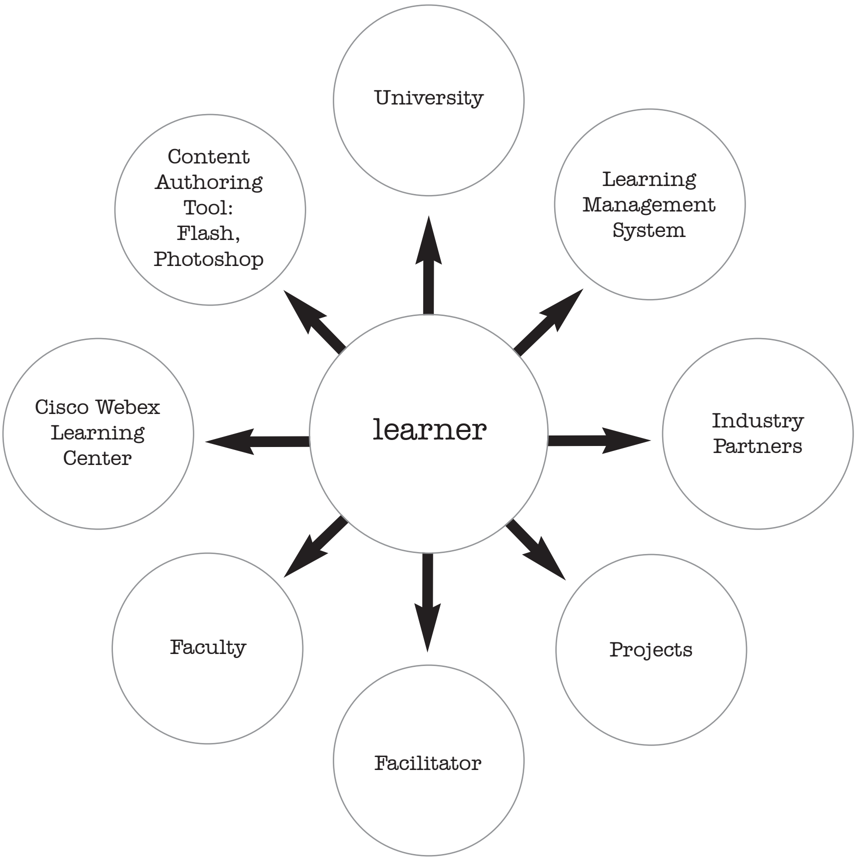
Towards a Better Future

An interesting experiment underway in the city of Pune provides a glimmer of hope that collaborative efforts of industry and academia can bear fruit. A significant software services firm, hard pressed for talented business intelligence (BI) and data warehousing professionals has partnered with a business school to build a steady pipeline of talent for deployment on domestic and global projects. Offered in two formats – a four month accelerated program with strong focus on business intelligence skills supported by inputs in general management and business processes and a more relaxed one year program that gives equal weightage to core management concepts and BI skills, the program has been designed to serve both the short term and ongoing needs of the firm. Graduates will have the skills to hit the ground running on the job without compromising the conceptual management skills needed to build successful program and business management careers in the long term.

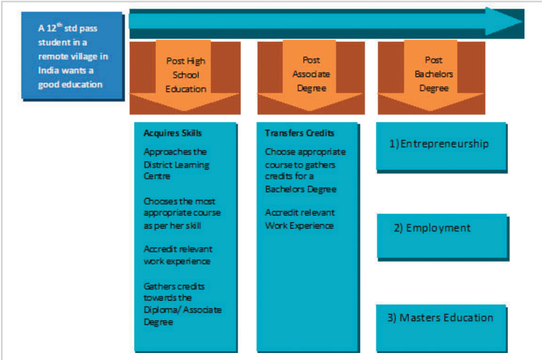
In the next phase, the company plans to have similar partnerships with several business schools around the country to recruit young candidates and give them the conceptual education that serves as the bedrock for their capabilities. Webex learning systems will be installed in all these classrooms around the country connected to a hub so that industry relevant skills can be provided by subject matter experts. These experts from the company shall provide training and project support synchronously to all remote locations straight from the workplace. The key learning from this experiment, which can so easily be replicated across a wide spectrum of technology and process expertise areas, is that it is possible to develop integrated models of skills and education designed and implemented to enhance both employability and capability of young people throughout the country.

Developing a New Technology-enabled Learner Centric Model

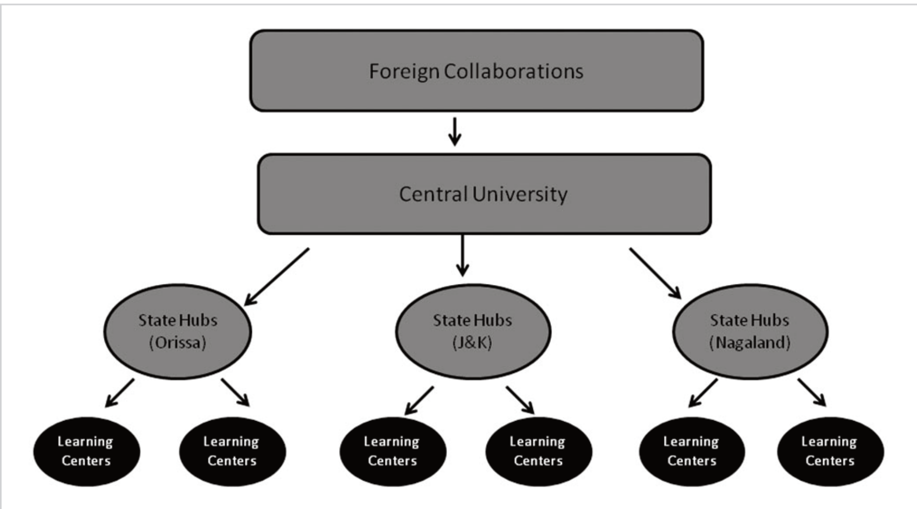
The solution to the ills that prevail in the regimented curriculum based education system and the weak vocational skills programs in the country lies in building a system that celebrates diversity and enables quality with scale across the system. Built on three fundamental precepts – a learner centric model of education, employable and contemporary skills and conceptual grounding in the subject area that is being covered, the backbone of a new transformational model will have to be technology. A new experiment that has been conceptualised through interactions between some renowned academicians and academic administrators, corporate chiefs and policy planning experts in the country could result in India's first truly open learning varsity which enables high quality learning to be spread all over the country and touch the lives of millions of aspiring youth seeking to build remunerative careers or build innovative new start-ups as well as provide lifelong learning capacity for knowledge seekers in corporations and academic institutions. The model of this proposed Open Learning environment is shown below.



The focus of attention here is the learner and not the institution or the professor. Technology connecting the learner to the fountainheads of knowledge enables her to be at home, in an institution or library or even in a remote corner of the country and still acquire the skills needed to become employable and start working or build a micro-enterprise. After acquiring the requisite skills and gaining some experience, she is able to continue learning even if she moves location because of the supportive eco-system that the model provides – a content management system with contemporary courses served through a Internet or videoconferencing mode, access to the best brains in academia as well as relevant projects from industry sources and the ability to learn "just in time" rather than "just in case". The transition of the teacher to a learning facilitator is one of the real strengths of this model, enabling scale to be achieved without the worries about quality of teaching that plagues the education system today. The skills to education transition that this model can achieve is shown in the diagram below.



In a country with its much talked about demographic dividend, it would be wise to remember that the large proportion of youth still live in the villages and small towns and to avoid ending up on the wrong end of the digital divide, it is both a responsibility and a challenge to enable them to join the skilled workforce rather than stray into non productive or even disruptive activities. The integration of skills acquisition and deployment with formal education and the ability to acquire qualifications will be the way to build a better educated and more employable citizen community in India in the years to come. In the coming years, a number of new model institutions will have to emerge and many present myths about the difference between brick and mortar institutions and distance learning will have to be demolished. There are a number of initiatives that have been talked about by the Ministry of Human Resource Development (MHRD) in recent times. The creation of a single body to supervise and regulate higher education, the Foreign Education Bill that would permit reputed overseas institutions to offer their programs in this country and the Innovation University concept.



The true Innovation University which would have great relevance in the current milieu would enable education to flow through a open learning environment from fountainheads of excellence including overseas education providers through technology enabled content hubs in key locations to learning centres accessible across the country. Research could flow back up the network, making it a mutually rewarding experience for all participants. Such a model is shown below.

None of this is new in the sense that technology enabled skills development and education has been successfully implemented in many parts of the world and the combination of skills and education has been successfully integrated in Germany, where vocational skills are run by the chambers of commerce with adequate government support and the industry decides the curriculum and provides internships. Training for employability is also the norm in Switzerland, Austria and Ireland - and even Brazil, Jordan and Qatar are looking at widespread use of technology to improve the quality of education and skills development.

Nothing succeeds like success and as the Internet and broadband proliferate in the country, there are some incredibly successful pilots to learn from, such as the skilling and employability enablement of multiple Malaysian student batches from a centre of Global Talent Track in India or the ambitious plan of the University of Kashmir in Srinagar to enable students within and outside the campus to receive expert inputs in a range of services areas to prepare them for jobs within and across the disturbed valley. The MHRD's laudable plans and initiatives will be successful only if there is truly a desire and will to make pathbreaking changes in academic pedagogy, methodology and regulatory processes. Nothing will be more worthy than an end-to-end capability developed in the country for an aspiring young person in remote areas to acquire skills, start working, transfer the credits from both courses and workplace learning to a formal education program and join the ranks of the educated employed and enlightened through the process of learning! The technology is there and if we can bridge the aspiration chasm, an inclusive India is well within reach!

References

[1] *http://www.india-reports.com/summary/eLearning_industry_india.aspx*

Ganesh Natrajan serves as Chairman of NASSCOM Foundation. Dr. Natrajan has been one of the most successful professionals in the Indian Information Technology Industry, having earlier been part of two major success stories in IT Training and Consulting, NIIT and APTECH. During his ten year stint as Chief Executive Officer of Aptech he grew its revenues fifty times and listed it on the Indian and London Stock Exchanges. He chairs the Outsourcing Forum of the Confederation of Indian Industries in Western India and is also a member of the Executive Council of NASSCOM, India's premier IT and BPO Association He has been elected Chairman of the NASSCOM Innovation Forum for 2005-07. He also has been Vice Chairman of Nasscom since April 2007. A Gold Medalist in Mechanical Engineering and Industrial Engineering, Dr. Natrajan completed his PhD in Knowledge Management at IIT Bombay. He is the author of three McGraw Hill Books on Business Process Reengineering and Knowledge Management and has also authored a book titled 'Winds of Change'. He is a regular columnist for India's premier Business and IT magazines. He was named 'CEO of the Year' by the Asia Pacific HR Conference in 1999 and received the Wisitex Foundation's 'CEO of the Decade - Knowledge Award' from India's Minister for Information Technology in 2000. In July 2005, he received the Asia HRD Congress Award for Contributions to the Organisation through HR. He was also the finalist at the Ernst & Young 2005 Award where he was recognised for exceptional entrepreneurship. He is an alumnus of the Indian Institute of Technology Bombay and the Harvard Business School.

Chapter 16

Mira K. Desai

Internet and Education in India

Crisscross Connection

Editor's Note

This chapter provides an in-depth analysis of the educational system employed at the school and college level and literacy situation in India. Statistically speaking, only 64 percent of Indians are literate; the proportion of English literates is 37 percent in urban and 17 percent in rural areas. It has been seen that only 5.8 million Internet users access Indian language content. Keeping in mind that 70 percent of India's population is below 34 years of age, makes education becomes an essential service. A number of educational service portals, such as Minglebox.com, 24X7guru.com, Extramarks.com, 100percentile.com, SmartClassOnline.com, WebDunia.com, Prabhasakshi.com, and the Ministry of HRD's own Sakshat (www.sakshat.ac.in), have sprung up to address this issue. Indian universities and colleges are now able to access journals online via INFLIBNET. Physical connectivity by providing roads in rural areas, electronic connectivity by providing reliable communication networks and knowledge connectivity by establishing more professional institutions and vocational training centres are the need of the hour for India.

My neighbor calls me to ask if there is a site that gives information about "importance of mother tongue" for her daughter's fourth standard school project.
My post graduate student told me, "Whatever you told us to read about does not exist since Google is not able to find it".
My research student working on social networking was thrilled that she stumbled upon a site about American Internet project having 'lots of material'.
My colleague at the Department is sitting in front of the computer and teaching students about ergonomics by showing them web sites. Another one was 'googled' by a local institution and was invited for a lecture.
A senior professor who received a research paper for a peer review told me that the author had not even taken the trouble to delete the hyper links from the text of the chapter.
I overheard a gang of girls on the photocopy shop telling each other, "You can't depend upon teachers these days. Internet is there so there is nothing to worry".
One of my friends told me that her friend has got her son enrolled into 11th standard online course of an American University sitting in Mumbai.
I came across a readymade presentation on 'cultural imperialism' that helped me understand my doctoral research in a few seconds which I had spent a few years researching.
Also, I was looking for a research paper by a scholar whom I did not know personally but based on the email id could send a message and get the entire paper 'free of cost', instead of subscribing to it in US dollars.

New Media and communication technologies like the Internet and the World Wide Web (www) and social media applications are widely diffused globally. With the advent of Web 2.0, unlike its earlier reading version, web became a reading/writing space, interactivity leading to global connectivity. This provides immense possibilities in using Internet for educational purposes.

Though India is the second country in the world as far as telecommunication growth is concerned, large percentage of Indian society is not a part of this new media revolution. India has 471 million wireless subscribers (as on September 2009) most would be able to connect to the Internet through mobile phones in the years to come. The Personal Computer (PC) ownership in households has increased to 7.8 Million. Although, 64 percent of the people are literate, 68 percent of them are educated below metric/secondary level. Out of the total literate population in India, proportion of English literates is 37 percent in urban and 17 percent in rural areas. Of the 149 million English knowing only 20 million Indians (<2% of all) prefer to read in English. Internet reflects nine out of the 22 official languages of India yet preference for vernacular content through Internet lacks awareness as well as usage.

Educational institutes in India have lately adapted to Internet mainly for administrative rather than academic endeavors; most lack in-house technical expertise, regular updating and responsiveness of Internet. This chapter borrows from personal experiences besides secondary sources and observational analysis about Internet and education. The issues associated with Internet for diverse educational segments- formal or informal, vocational/technical/professional, pre-primary, primary, secondary or higher education, conventional or Open and Distance Learning segments have been explored.

Undoubtedly, Internet has made enormous possibilities 'day to day reality' for many of us while it's still a technology accessed by a few in the country. This chapter examines education in its broadest spectrum and explores strength and weaknesses, threats and opportunities for Internet and education in India.

We are aware, that there exist multiple "Indias". The first India, having 'elite access' in terms of material and physical resources to make their existence comfortable enough to talk about the other 'India' from their cosy armchairs. At times referred to as 'Bharat', the another may not be English-speaking, yet their 'power of pocket' has opened many doors. Post-globalisation television, airlines, consulates, food companies, many of them, modified their 'language of conversation' for that Bharat. The third 'Bharat', a vast majority that aspires to send their children to 'English school', spend money on goods and services, desires to travel abroad, is growing. But the ''bottom of the pyramid', the last and the largest 'Bharat' survives on day-to-day livelihood, mostly absent from our media and textbook discourses. They are also the ones who have not been serviced by our formal education systems. Internet, for sure, can integrate all these "Indias" since television keeps segmenting further.

Overview of Education Sector

Education in any society has varied purposes, a fundamental one being 'development' of human beings. American systems emphasise citizenry, British systems focus on development of character, France and Germany on intellectual development whereas Roman Catholic processes are concerned about moral values. It can be focused on the needs of the individual or that of a given society. Education encompasses formal or non-formal, vocational and/or technical, pre-primary, primary - tertiary and higher education, conventional/face-to-face or Open and Distance Learning (ODL).

In a country like India, having complexities of language (22 official languages), geography (28 States and 7 Union territories), climate (flood and drought in the same time), culture (100+ mother tongues), religion (8 of them), various school Boards (SSC- State Secondary Certification, CBSE- Central Board of Secondary Education, ICSE- Council for Indian School Certification Examination and the new entry, IB- International Baccalaureate), education that 'fits all' is not only a challenge but utopia. Yet, with 70 percent of its population below 34 years of age, education is an essential 'commodity'in India.

Post 1976, education is on the concurrent list, which makes the Centre responsible for providing general direction, in terms of educational policy and curriculum, the running of the vast school network is the responsibility of individual state governments. As far as formal education is concerned, Indian institutional framework consists of Universities established by an Act of Parliament (Central Universities), a State Legislature (State Universities), Deemed Universities (institutions which have been accorded the status of a university with authority to award their own degrees through central government notification), Institutes of National Importance (prestigious institutions awarded the said status by Parliament), Institutions established under State Legislative Act and colleges affiliated to universities (both government-aided and unaided).

In 2010, India has 42 Central Universities, 259 State Universities, 24 Deemed Universities and five institutions established under State Legislation, 13 Institutes of National Importance established under Central legislation and 65 (in 16 states of India) private Universities. There were 18,064 degree and post-graduate colleges (including around 1902 women's colleges), of which 14,400 came under the purview of the University Grant Commission(UGC) in March 2006. The rest were professional, under the purview of the Central Government or other statutory bodies like the All India Council of Technical Education (AICTE), Indian Council for Agricultural Research (ICAR), Medical Councils of India (MCI), Central Council of Homeopathy (CCH), Central Council for Indian Medicine (CCIM), Rehabilitation Council of India (RCI), Bar Council of India (BCI), Indian Nursing Council (INC), Council of Architecture, Pharmacy Council of India (PCI), Dental Council of India (DCI), National Council for Teacher Education (NCTE) and various State councils of education. There is a move towards formation of a Higher Education Regulatory Authority to umbrella all these bodies.

In school education, the figures are daunting -- recognized schools imparting elementary education is over 1,285,576, of which 80% are government-run. The Right of Children to Free and Compulsory Education Act 2009 affirmed the government's guarantee of education to all children within the age-group 6-14 years, in proper schools with trained teachers. India has 290 million students attending school every day, under 35 state boards, two central boards and a host of educational agencies responsible for the administration and health of the schools. Distance Education Council, in the year 2004, reported the existence of 429 academic programmes, with 3483 courses across 11 ODL institutions across India. Indira Gandhi National Open University (IGNOU) has 175 programmes on offer and through its 21 schools of study has enrollment crossing three million.

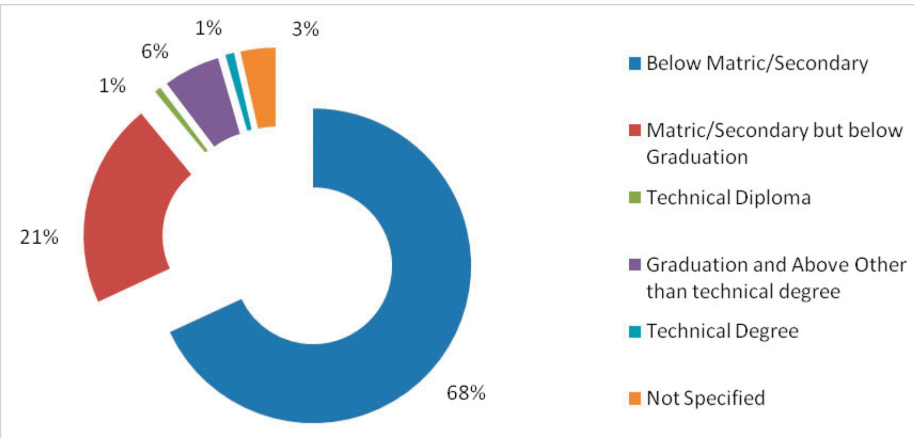
With such an infrastructure, educational status of the 64 percent literate population is not very encouraging (see Graph 1). Though Internet access has nothing to do with formal educational background of the user, as proved by experiments like 'hole in the wall' (http://www.hole-in-the-wall.com/Beginnings.html), it does demand infrastructure and readiness.

Internet in India

After the introduction of the Gateway Packet Switching System (GPSS) in 1988 and email in 1991, Internet services in India were launched on 15th August 1995 by Videsh Sanchar Nigam Limited (VSNL). Ever since, the Internet subscriber base has been growing steadily in India (see Graph 2).

Telecommunication Regulatory Authority of India (TRAI) in its Annual Report of 2008-09 notes an increase in the overall tele-density of the country at the end of March 2009 to 36.98% (26.22% in March 2008) and rural tele-density to 15.20% (9.20% in March 2008). Besides the Internet subscribers mentioned above, there are 117.82 million wireless data subscribers who are accessing Internet through wireless (GSM and CDMA) networks. The number of broadband connections on 31st March 2009 was 6.22 million compared to 3.87 million in the previous year.

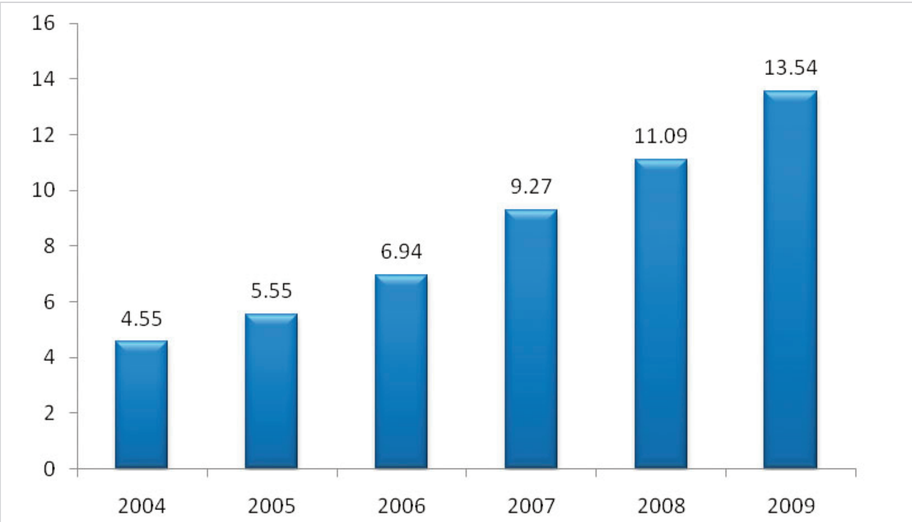
Graph 1: Educational Background of Literate population in India



ICT profile of India (2005/06), prepared globally, too confirms the ground reality, as out of the total population of 1.037 billion, only half (52 %) has literacy in national language. Per 100 inhabitants computer ownership is 0.6, telephone lines are 4.2, cell phone subscribers are 1.73 (2001),

Internet users are 1.65 and subscribers are 0.33. Per 10,000 inhabitants, Internet hosts are 0.35, Internet cafés/tele-centres users are only 0.1. the number of websites in the national language(s) is only 20,000 while the number of websites in English and other language(s) is 1, 30,000. (http://www.apdip.net). As per UNICEF figures, in 2007, there were 20 phones per 100 people in India whereas there were 7 Internet users per 100 population.

Graph 2: Internet Subscriber Base in India (in Millions)



Source: TRAI Annual Report 2008-09

According to Tata Consultancy Services (TCS) Survey, Generation Web 2.0, students today are shifting their academic and social life online and embracing the digital world as true digital natives. India has 818 million people above 12 years of age, 64 percent literates, 149 million English knowing, 87.1 million computer literates, 71 million of 'claimed Internet users' of which 52 million were active (as on September 2009) which was 36 million in September 2008. Internet And Mobile Association of India (IAMAI) researches reveal that email, search and online gaming as the most frequent Internet applications used by Indians. IAMAI press release of September 2010 suggests that only 13 million Internet users were aware about vernacular content on Internet. Table 1 suggests that so far 'education' does not figure in the Internet usage by Indians but it may be a 'searched' for service. My researches with young women revealed that they were introduced to Internet in schools or they went online for the first time in their life when applying to appear for the Common Entrance Test.

Internet and Education

Internet and education includes education about Internet, education through Internet, Internet in the classroom, educational alternatives on Internet, and so on. Undoubtedly, Internet has revolutionized the very concept of 'education' and even changed the definition of education. Academic institutions could establish websites, making their presence global. Admission lists, examination results, bulletin boards, announcements are few one-way applications. Web 2.0 made more alternatives possible through social media, chatting and User Generated Content by various stakeholders like students, parents, industry, government, teachers, and administrators, all on one platform. Video tutorials, webcasting, podcasting, online curricula, Internet radio, real-time online examinations, virtual classroom/campus, chat room counseling, networking, self-publishing, teaching resource uploads/sharing, online academic journals, online journal site management are few more applications. So far, fewer of these are reality in Indian education but soon more will hold ground.

Table-1: Internet usage pattern by Indians from 2008 to 2009

Top 10 Online Activities	% in 2009	Change from 2008
Search for travel products	84%	-
Job search	71%	-0.3%
Search for non-travel products	68%	-
Instant messaging/chatting	67%	-3%
Check general news	62%	-1%
Dating/Friendship	55%	+5%
Check cricket content/score	53%	+3%
Check sports other than cricket	52%	-
Matrimonial search	49%	+0.4%
English info search engine	49%	+0.6%

Source: India Online 2009, Juxtconsult Market Research Report

Considering that the largest segment of 'formal education infrastructure' is at the school level, introduction to computers have come as early as first standard in ICSE and Internet would soon follow. There are other reports like '4,000 pupils of schools from four regions of India were given free access to Heriot-Watt SCHOLAR online learning system in November 2004 due to British Council and SCHOLAR's publisher Interactive University' (IBN,2004). Department of School Education and Literacy, Ministry of HRD has made the National Policy on ICTs in School Education (GOI, 2008). The document discusses the problems of ICT in education and possible solutions to the problem. The site (http://www.csdms.in/gesci) suggests important civil society engagement with education across geography. At the same time, by government statistics, 20% of schools do not have drinking water available on the premises; 38% of schools have no toilets. In reality, a large proportion of the taps and toilets shown on paper do not actually function. Inadequate space and ventilation, leaking roofs, broken floors, and unusable doors and windows are common even in urban government schools where supervision is somewhat better. The situation in remote rural schools is much worse. Teachers' capacity building is a challenge by itself since availability, regularity, approach, attitude are other issues associated with primary school teachers.

Corporate and civil society spaces have successfully managed and encashed on the Internet for education. Government too has recognized the value of Internet for governance, transparency, and feedback. India (2010) report notes examples of use of Internet by Ministry of Food and Civil Supplies (www.fcanin.nic.in), Central Health Education Bureau (http://.cheb.nic.in), Consular-passport and visa services, Press Trust of India (PTI) (http.//www.ptinews.com) for consumer/public education and communication. StreeNet is the first online course in women's studies by a women's organization AKSHRA based in Mumbai, India. It uses e-Learning for building a community of gender conscious social activists and college students (http://www.aksharacentre.org). India has numerous community information initiatives (Ghosh and Das 2006, Harris & Rajora 2006 and Agarwal 2007, Bhatnagar and Schware 2000). Swiftjyoti (www.niitercs.com), Informationthela (http://www.it.iitb.ac.in), Tele-centres on wheels (http://portal.unesco.org) are other initiatives. There are number of papers on ICT in education on http://www.csdms.in/gesci, many still remain pilots.

There are educational portals helping Indian students in admission, course selection, capacity building, even information about available alternatives. Minglebox.com, India's campus and education network with a user base of students and young professionals across 250 cities in the country was started by a group of IIT/IIM alumni in 2006. Portals target students from Standard 3 to 10 (aged nine to 16) and some even provide platforms for online assessment (24X7guru.com, extramarks.com) and engineering examination preparation (100percentile.com). On 26 October, 2006, the then President APJ Abdul Kalam launched Sakshat, a free portal of Ministry of HRD (http://www.sakshat.ac.in) to help overcome "vast disparity" of educational facilities available in various regions across India. Network18 group's online and mobile arm Web18 and education company Gecom International have jointly launched MySchool.in.com, an online education portal for K12 students (Kindergarten to class 12). Smartclassonline by Educomp offers online tutoring and a content library, while Meritnation by (Infoedge funded) Applect Learning Systems, features a comprehensive library of sample test papers. There is little data available in public sphere about the utilization of these.

Bill Gates, in his book *The Road Ahead* devotes a chapter 'Education: The Best Investment' and clearly covers most issues that can apply to the Indian situation. Indian classrooms have a long way to go before they become electrified and media enabled. Working at the university department, being in academics for over decade and a half, my visits to various universities/institutions/colleges tell me that a room having an Internet-enabled computer and LCD projector is still a show piece which gets used whenever some special programme is organized. The managements of colleges are far more pro-active, private universities too offer the facilities to a large extent (Manipal University has a wireless campus) but the public universities are still handicapped by multiple factors.

Challenges for Internet and Education

Infrastructure

India has still a long way to go as far as connectivity is concerned. At present, Common Service Centers (CSCs) and cyber cafes serve as the primary mode of accessing Internet in rural areas. More than 70% of the rural population access as the Internet through CSCs, cyber cafes (estimated 10,000) or State Wide Area Network (SWAN) Scheme. Though wireless has become a norm in urban India; the dial-ups through BSNL as on 31.07.2008 were around 5.5 lakh.

CSCs are being presented as a viable option for rural connectivity in India (2010) ensuring the setting up of114548 CSCs, the statistics of 27 States Out of which, around 43,464 CSCs have been rolled out in 21 States by end of June 2009. The issue of connectivity to the CSCs has also been addressed by BSNL providing connectivity to 41500 CSCs. But as Harris and Rajora (2006), based on their evaluation study of 18 ICT4D projects note, "several projects (ICT for rural communities) have failed to understand the importance of cultivating close relationships with their beneficiary community, either by employing inappropriate staff within tele-centre or by failing to supply incentives for those staff to ensure that they are sensitive to the needs of the community".

In 2008, Tata Tele Services (TCS) together with SNDT Women's University, Atom Tech (Any transaction on mobile), and Indian PCO Teleservices announced launching of education through mobile (m-education) for communities particularly belonging to rural areas and physically challenged. In the same year, IGNOU collaborated with the Communication and Manufacturing Association of India (CMAI) to deliver educational content via the mobile phone, giving text, audio and video, to students who register for their courses. Pahwa (2008) considers targets of reaching 25 million mobile education students by 2009, and 50 million by 2010 as obscene. There is no update about both these projects on websites. In 2010, English Seekho, a phone-based English tutor, a new media product of IGNOU which is a 2-month-old phenomenon had earned 1.5 lakh registered students.

Policy & Pedagogy

It still would take ages to make Internet access in schools and universities mandatory. My personal experiences indicate lack of positive attitude and reluctance to provide access operationally while the policy directives may not be the impediment to the infrastructural arrangement. Also, the pedagogy of access to Internet in the classrooms would demand teacher's psychological security with self and intelligence and inclination to use Internet with her/his students. So, only policy facilitation may not be sufficient, pedagogic innovation by the teachers is also the need of the hour. Most of the material available is about 'possibilities' rather than 'practices'.

Indian Languages on Internet

India has 22 officially recognized languages. Yet the Internet largely represents only eight. ICANN (The Internet Corporation for Assigned Names & Numbers) has approved countries to apply for Internet extensions reflecting their name – and made up of characters from their national languages. By May 2010, Indian government's Department of Information Technology (DIT) was to submit the proposal to have Indian domain names in 7 Indian languages – Hindi, Bangla, Punjabi, Urdu, Tamil, Telugu and Gujarati. The research titled "Report on Vernacular Content: 2010" highlights that out of 13 million active Internet users aware of online vernacular content, 9.8 million are aware of regional language content on emails but only 5.8 million use it. The report also projects that about 6.6 million are expected to access Internet through vernacular content. Similarly, about 6.3 million are aware of search engines in local languages but only 3.1 million use it. Google offers searching in 13 Indian languages, Gmail in five languages and Google transliteration in 11- Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Nepali, Punjabi, Tamil, Telugu and Urdu. prabhasakshi.com and webdunia.com are amongst few of the Hindi portals online. Guruji.com is India's first Internet search engine, founded by two IIT Delhi graduates, and backed by Sequoia Capital, the company focuses on developing search products enhancing the Indian user experience. The first phase of the launch covered Hindi, Telugu and Kannada language search. Educational content in Indian languages is still not a regular feature due to demand and supply issues while blogging seems to be catching on.

Internet and Education: SWOT Analysis

Strengthes

Young adults comprise of one third of active Internet users in India and education is one of the most important aspect of their lives. This makes Internet and education the most interconnected reality. At this stage my understanding tells me that Internet and education are used mainly by individuals for their personal endeavors. Internet is educating individuals in anything and everything leading to newer definition of 'education' itself. India also has human resources that can be utilizing Internet to its fullest for educational endeavors.

A social activist who is ex-Indian Administrative service officer, Jayaprakash Narayan (Lok Satta party) established his political party/career and expanded his network to Mumbai (http://www.votemumbai.org/) through the Internet. Individuals, through community/collective action, are spreading messages of Meter Jam (boycotting auto rickshaw and taxis) using social networking sites. While there are many unnoticed, undocumented individual and collective experiments and experiences of/on/about Internet, they do in a way contribute to education at micro and macro levels.

My research on mobile and Internet usage by young women residing in hostels revealed that they are empowered and confident due to connectivity and access. There have been a few institutional attempts, like UGC's Infonet initiative, which has a nationwide high speed communication network for information sharing, access to educational materials and distance education in which 149 universities are connected, having 108 network managers from 99 universities trained at ERNET centre at New Delhi and INFLIBNET centre at Ahmedabad. It would use Internet for sharing of resources, leading to Indian academic knowledge resource online. The network utilization studies refer to possibilities and theories and little about actual usage.

Table 2: SWOT of Internet in Education

STRENGTHES	WEAKNESSES
• Anyone, anywhere, anytime can learn any thing- classrooms without walls • Network and consolidation on global scale • Freedom from constraints of classroom and access to global teachers, lifelong learning • Cross-cultural, cross-disciplinary interaction is possible	• Pre-requisite of technical infrastructure • Pre-supposes technological and language abilities and aptitude to explore • It is more of 'knowing' rather than 'doing' • Changing role and readiness to embrace technology by teachers • Protecting intellectual property and individ ual privacy
OPPORTUNITIES	**THREATS**
• Access to global audience/information/knowl edge • Integration of 'one world' and global citizen ship • Documentation of indigenous, subjective, con textual knowledge in multiple forms • Pedagogic innovations in conventional class room, multiple devices to access	• Real human contact reduces as most is medi ated through technology, makes people isolated individuals • Mouse advocacy- real action may be missing • Plagiarism and ethics in usage of in formation • Potential misuse for violent, anti-governance, anti-society purposes

Table-3: Percentage Distribution House-Holds assets/banking access by rural urban

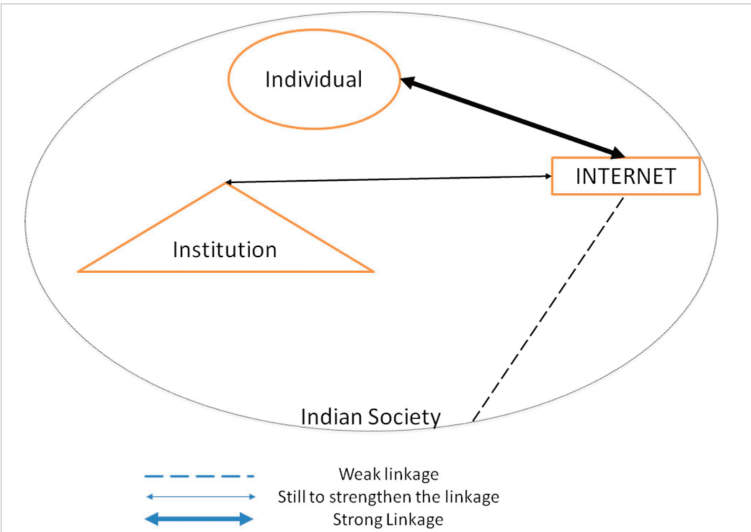
	Availability of assets							Total HHs availing Banking
	Radio	TV	Phone	Cycle	2-Wheeler	4 – Wheeler	None Specified	
All India	35.1	31.6	9.1	43.7	11.7	2.5	34.5	35.5
Rural	31.5	18.9	3.8	42.7	6.7	1.3	40.5	30.1
Urban	44.5	64.3	23.0	46.0	24.7	5.6	19.0	49.5

Weaknesses

The census of India, 2001 household data reveals that even by the beginning of twenty first century, one fourth of Indian population resides in slums, indicating poor quality of life. Half (precisely 52.5%) of the Indian households use firewood for cooking and only 17.5 percent of Indian households have LPG stoves for cooking. Half (53.6%) of the houses are without drainage, majority (63.6%) of households do not have latrine/toilet facilities and only one-third (36.1%) have bathroom facility within the house. The status of electricity is equally dismal, as 44 percent of the households in India do not have access to electricity. Table 3 illustrates the differences of asset ownership across rural and urban households in India and usage of banking facilities.

In urban India, the penetration is faster but schools, colleges and universities still do not provide unlimited Internet access to their students, a norm in many Western countries. Computer labs are still privileged places and many students cannot make private investments in digital devices to access Internet. At the same time, institutional infrastructures in India in form of District Educational Technology (DIET) Centres, State Educational Technology Centres (SIET) and National Council of Educational Research and Training (NCERT) have yet to contribute to their fullest. The first online course of CIET (Action Research in Educational Technology) was to be launched on 22nd Nov 2010 for teacher educators from DIETs.

Graph 3: Internet and Education in India



Technical infrastructure is an issue most relevant in India as even at the time of writing this, IIT Mumbai had discontinued its live webcast of courses due to "technical reasons". (http://www.cdeep.iitb.ac.in/Live_webc). Indian media keeps reporting technical difficulties in online admissions or online CAT examinations. Graph 3 shows that the linkage of individual with the Internet is strongest whereas with the society it is the weakest. The institutional linkages of Internet still need to be strengthened.

Opportunities

India has a history of 200 years of colonial rule which has led to a comfort level of Indians with English. But only 20 million Indians (<2% of all) prefer to read in English (Juxtconsult, 2009) and only 42 per cent of Internet users use local Indian language websites, which is higher by eight per cent compared to 2008. Only 13 percent of existing Internet users prefer to read in English. Internet in Indian languages is a huge opportunity for various stakeholders in education.

The Internet community in India is the fifth largest in the world, although Internet users formed only about 4.3 percent of the country's population in 2005. Despite 160 operational Internet Service Providers (ISPs), just 10% of the ISPs have 90% of the subscribers (BSNL and MTNL holding on to 70%). Cybercafés have certainly been playing a major role in fuelling the development of Internet in India. About half of the total Internet subscriber base finally had broadband access coming into 2010. IAMAI research in 2006 found that an estimated 38 percent of all Internet users in India are "heavy users" and spend an average of 8.2 hours per week on the Internet. This clearly reveals opportunities at all levels.

Village Knowledge Centre (VKC) Project by the Swaminathan Foundation refers to villages wired by PCs and telephones; volunteers gather information and feed it into an Intranet and provide access through nodes in different villages. In Veerampatinam village (in Pudducherry), a fisherwoman downloads every day the weather data from the U.S. naval oceanographic office operated by the Department of Ocean Development information on the longitude and latitude of the place of fish schools. Now, these women have put up loudspeakers to announce the information (Gulati and Dogra, 2006).

In higher education, small number of universities and colleges are eligible for funding by UGC and monitoring for quality by National Academic Accreditation Council (NAAC) shows a vast majority of institutions under no quality monitoring and control except occasional university team visits. Internet may facilitate administrative procedures but how far it gets effectively used for communication in academic spaces is to be seen in the time to come.

Table-4: Socio-geographic landscape of India

Total Indian Population (in Millions)	818 Million	
	Rural	Urban
Population	568	250
Literate Population	368	205
Computer Literates	15.1	85
English-Speaking Population	63	86
Claimed Internet Users	5.5	57
Active* Internet Users	3.3	42

Threats

Digital divide has been a long debated conception, very much applicable to Indian demography (see Table 4). The classic example is online railway booking portal IRCTC (Indian Railway Catering and Tourism Corporation) which has opened business avenues for communication centres in mofussil towns which along with telecom facility provides railway tickets, fax, Internet access at commercial value. Undoubtedly, one may look at these as availability of services, at the time it creates local power centres controlled by local elites. In reality, little 'access' is 'real' in such circumstances.

Assuming that the infrastructure is established with the funds from one plan, the maintenance is a challenge in the absence of technical staff and at times lack of proactive support from the authorities. Internet presence through websites is another challenging proposition for educational institutions. Having been very closely involved with my own department site design and hosting and having seen my university's website management issues, factors like lack of technological understanding amongst authorities, reluctance to approve budgets, coordination of site-administrators-content providers and site-managers, lack of responsiveness to incoming messages/mails and lack of techno-savvy approach or sheer reluctance to embrace the new are impediments. Preethi J (2010) notes that in spite of three years of existence the Commonwealth Educational Media Centre for Asia CEMCA's EasyNow (http://cemca.org/easynow) virtual campus project is still going rough due to technophobia. "It is just a demo piece in India," as remarked by Dr. R. Sreedhar, Director, CEMCA.

In March 2007, Indian Institute of Technology (IIT) Mumbai banned Internet between 11 pm. and 12.30 pm at its 13 hostels "to encourage students to sleep early and to try and force them out of their 'shells'". The newspaper report stated a decline in academic performance and decrease in sporting, cultural and social activities. The report cited, "surfing, gaming and blogging affecting students' performance, making them reclusive and even suicidal". In November 2010, IIT Kharagpur is mulling over a similar move after a suicide at its hostel.

Future of Internet in India

The logic of reducing the cost of ICT with scaling up of usage may not apply to a country like India where 'information infrastructures' are not technology - centric and oral cultural traditions have sustained societies for centuries. Scaling up means uniformity, which is largely irrelevant in a context of linguistic and other diversities of the country like India. No doubt, one is not proposing that the country needs to live in pre-historic times in caves when world is going to Mars, but when food-shelter-clothing needs of the large majority are yet to be addressed, education-health-gender parity are still contested areas, how justified it is to invest in so-called technology infrastructures?

If one takes application-oriented approach, Internet in the years to come would bring about changes in the way we communicate (though that change has already taken place and it may become routine), entertain ourselves, express ourselves and probably the way we understand others. It is going to create newer communities, however 'virtual' they may be, it would create newer play modes however monotonous they may become, it would create clichés of its own.

The content on Internet is already from mundane to mandate, but in years to come we may witness newer ways of reaching out, newer ways to connect, collaborate and convince. Marketing may become far more intruding, education may become far more liberating, networking may become far more encompassing, advocacy may become far more 'real'. Many more people would go online; bring in newer usages. While individuals may become more and more empowered, courtesy Internet, society might need ways of 'listening' to alternate voices, government may need to become more tech savvy and tolerant to expression of dissent, businesses have to learn to manage 'digital reputations' more intelligently since the consumers would also have newer ways to record resistance.

Apart from technological and hardware factors, "existing social division and disparities are much sharper than digital divide…it has to be viewed in the context of few other access realities [like]…electricity, telephone, computers, Internet. ICT especially, Internet access and use has no relevance to the land-less poor as long as it does not provide 'roti and rozi' (bread and employment)" (Sarkar, 2002:4). Hopefully in years to come, far more number of people in India would invent newer ways of improving their quality of life by using the Internet.

Recommendations

Intelligent classrooms or multimedia class rooms at least in professional and technical courses are the need of the hour. In the era of globalization, if we want our graduates to compete with the world, they would need access to up to date technology and knowhow. The higher educational institutions suffer from large quality variation in so much so that a Nasscom-Mackinsey Report (2005) stated that not more than 15% of graduates of general education and 25-30% of Technical Education are fit for employment. Internet opens a vast array of applications and resources for human resource development and it can be far more effectively utilized at least for higher education. Training teachers by making them technology-enabled and Internet-savvy can be the first step in the direction to invest into the future of our country.

Dr. A.P.J. Abdul Kalam, President of India (July 2002 to July 2007) coined a term, PURA (Providing Urban amenities in Rural Areas) which aims at delivering three types of connectivity: physical connectivity by providing roads in rural areas, electronic connectivity by providing reliable communication network and knowledge connectivity by establishing more professional institutions and vocational training centres. Hopefully, the vision will be realized in concrete actions and the assumption that "knowledge" lies in urban centres and 'development' as is in urban context will transform itself to value indigenous knowledge, local needs and change in the quality of life of people, apart from the 'physical' quality of life.

Internet can bridge the gap of formal education with the world of work, this disconnection, when bridged, would contribute to the betterment of our society.

Resources

Agarwal Ashok (2007) (ed.) E Governance Case studies, Universities Press India (Pvt.) Ltd., Hyderabad.

Behal Suchitra (2007) INDIA: Parents not spending enough on higher education, 25 November 2007, Issue-007 URL: http://www.universityworldnews.com/article.php?story=200711221526013 retrieved on October 1, 2010.

Das, Anup Kumar and Lal, Banwari (2006) Information literacy and public libraries in India, http://openmed.nic.in/1278/01/ Information_Literacy_Public_Libraries_ India.pdf accessed on January 10, 2008

Ghosh S.B. and Anup Kumar Das (2006) Information Literacy Initiatives in India with special reference to knowledge economy, Published in the proceedings of the International Conference on Information Literacy (ICIL 2006), June 14-15, 2006; Kuala Lumpur, Malaysia.http://eprints.rclis.org/archive/00007246/01/InformationLiteracy ICIL06_Paper_full.pdf accessed on January 10, 2008

Goertzel Ben (2010) Cosmist Manifesto Jun 26, 2010URL: http://ieet.org/index.php/IEET/more/goertzel20100626/retrieved on October 2, 2010.

GOI (2008) Towards a national policy for ICT in school education in India: A multi-stakeholder perspective, Collaborative effort of Ministry of Higher Education, CSDMS and Global e-Schools and Communities Initiative (GeSCI), UN Solution Exchange URL: http://www.csdms.in/gesci/pdf/gesci_compendium2008.pdf retrieved on October 2, 2010.

Gulati Anjali and Seema Dogra (2006) Interdependence of Right to Information and Information Literacy: An Indian WORLD LIBRARY AND INFORMATION CONGRESS: 72ND IFLA GENERAL CONFERENCE AND COUNCIL 20-24 August 2006, Seoul, Korea, Perspective Meeting: 82 Division of Regional Activities.

Harris R & Rajesh Rajora (2006) Empowering poor- Information and Communication Technology for governance and poverty reduction, A Study of rural development projects in India, UNDP-APDIP ICT4D series, Elservier, New Delhi.

IAMAI (2009) 3.3 million active Internet users in Rural India, 14th January 2009, URL: http://www.iamai.in accessed on March 28, 2010.

IAMAI-IMRB (2009) Mobile Internet in India, December 2009, Research conducted by IMRB and etech for IAMAI, URL: http://www.iamai.in accessed on March 28, 2010.
IBN (2004) World's largest e-learning programme launched in Indian schools, Publication: Internet Business News, October 12 2004, URL: http://www.allbusiness.com/human-resources/careers-job-training/230505-1.html
I-Cube (2008) I Cube Internet in India 2008, etech IMRB IAMAI, Mumbai.
India Country Summary of Higher Education
http://www.cscsarchive.org/dataarchive/textfiles/textfile.2008-05-06.5333577190/file
Juxtconsult (2008) India Online 2008, Main report, Juxtconsult, New Delhi.
Juxtconsult (2009) India Online 2009, Understanding online Indians and their Net usage behaviour and preferences, Just consult 3600 Market Research Online report, downloaded from URL: www.juxtconsult.com
Kundu Shubhankar (2010) Indian education is steering online, 17th May 2010, Express computer, URL: http://www.expresscomputeronline.com/20100517/trend01.shtml retrieved on October 1, 2010.
Pahwa Nikhil (2008) IGNOU Plans To Provide Education Via Mobile…Obscene Targets, November 5th, 2008 URL: http://www.medianama.com/2008/11/223-ignou-plans-to-provide-education-via-mobileobscene-targets/ retrieved on November 1, 2010.
Paul Budde Communication Pty Ltd., India-Key Statistics and Telecommunications Market Overview, 2006, p. 2.
Prasad S (2008) Net changing India's education system, ZDNet Asia, April 9 2008, URL: http://www.zdnetasia.com/net-changing-india-s-education-system-62040006.htm
Preethi J (2010) India's Apathy & Anti-Open Source Attitude Plague CEMCA's EasyNow, February 22nd, 2010 URL: http://www.medianama.com/2010/02/223-cemcas-easynow/ retrieved on November 1, 2010.
Sarkar, Partha Pratim (2000) Issues of Digital Divide in South Asia: IT for People- Experiments in the Region. 2002 International Conference on the Digital Divide: Technology and Politics in the Information Age, Kulalampur, Malaysia cited in Agrawal Binod C. (2004) Reflecting Information Communication Technology's Role in India's Development Promises and Performances, Invited presentation in the National Seminar on Information, Communication Technologies and Development held at M.S. University of Baroda, Vadodara: 390 002 January 23-24, 2004.

Websites
- *http://www.ugc.ac.in*
- *http://www.trai.gov.in*
- *http://www.neupa.org*
- *http://www.indianlanguages.com/main/index.php*
- *http://www.mahesh.com*
- *http://www.pluggd.in/*
- *http://www.eindia.net.in/2008/telecentreforum/index.asp*
- *http://www.mit.gov.in/default.ASPX?id=191*
- *http://www.apdip.net/projects/dig-rev/info/in/*
- *http://info.worldbank.org/ict/ICT_ssp.html*
- *http://www.medianama.com/*
- *http://news.oneindia.in/feature/2010/web-content-indian-languages-study-survey.html*
- *http://www.internetworldstats.com/asia/in.htm*

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Chapter 17

Arun Jethmalani

Financial Inclusion and the Internet

Editor's Note

This chapter covers the impact that the Internet is having on our personal lives for financial management, and on businesses like IT, BPO and financial services. Early pioneers in Internet banking and finance in India were ICICI Bank and Geojit Securities, followed by HDFC Bank, SBI Indiainfoline and Kotak Securities. Today, the stockbrokers are far ahead of the bankers, insurers and money managers. Nearly 6 million retail customers are registered on NSE and the trading value exceeds US$10 billion, more than 10 per cent of all traded volumes. Branch transactions have fallen to 13 per cent, as compared to ATMs (46 per cent), Internet banking (38 per cent), mobile banking (1 per cent) and call centre (3 per cent). But less than 5 per cent of Indians access the Net. A smaller number buy mutual funds and stocks. Only 34 per cent of Indians have a bank account. Net usage and commerce cannot increase unless more people have a "personal" device to access the Net. The opportunity for mobile banking is therefore unparalleled, but better partnerships need to be called for between operators, service providers, and other non-banks.

The arrival of Internet has set in motion various changes in personal lifestyles and business patterns. With technical breakthroughs, the financial sector too has benefited, though the adoption is only a fraction of the potential. The main problem being, usage and penetration of the Internet in India, which has been extremely low compared to many other countries. While factors like changing consumer profiles and huge cost savings are driving the technology adoption, several constraints still exist in terms of security and privacy. For large scale mass adoption, how can millions of Indians be provided with an access device and a Net connection? Mobile phones are turning out to be a huge opportunity to truly accelerate financial inclusion. The large un-banked population is eagerly waiting for some gutsy policy making and innovative solutions from institutions and private players.

In the late 90s, we were told that the Internet would change our world, only we thought it would happen overnight. The ensuing disappointment has in some ways, downplayed the impact that the Internet has actually had. For many of us, it has indeed changed our lives – even if in ways we never imagined.

Very few have ended up as billionaires, but the dotcom bust hasn't deterred the never-ending flood of hopeful start-ups. One unfailing characteristic of the Internet has been its ability to surprise all of us: Yahoo, Amazon, Google, eBay; and now Facebook, Linkedin, YouTube. New winners keep emerging, often creating brand new markets. Even away from the spotlight, there are innumerable small, successful, Net-centric businesses being created every day.

Enabling Indian SMEs

But the Internet in India story has been rather muted – at least in terms of creating huge new brands or businesses. Barring a few notable exceptions, the hype has far exceeded expectations. Some of the early entrants moved off-line and thrived, while others have faded away. Yet, the real story isn't about the number of billionaires, but the all-pervasive impact it's having on our personal lives, and on business.

Changes in personal patterns, of shopping or networking or playing, are very much in the public view. In fact, there is endless media coverage of how we are all becoming slaves to Facebook, Linkedin or Google.

But it's businesses that are being truly transformed. The very notion of outsourcing knowledge services like analytics, research, content or legal work rests on the Internet architecture. Without the Net, most KPOs would not exist and the Indian IT and BPO industries would be shadows of themselves. The same goes for a wide range of knowledge companies that are mushrooming across India – gaming, social networking, search engine optimisation, catering, flower delivery, any kind of home delivery business, head hunting, and thousands of other niches – where companies, primarily SMEs are all linked to each other and their customers via the Internet. For an already entrepreneurial young population, the Internet has enabled lakhs of new start-ups, including home businesses.

Patchy Innovation and Adoption in Financial Services

For customers of financial products too, life has truly changed. Not very long ago, we had to call a broker on a (rare) land-line, place an order and wait till the end of trading day to find out whether the transaction was completed, and at what price. Then we had to fill numerous forms, attach stamps and share certificates, and send these (by registered post) to registrars. If we were lucky, we received the transferred share certificates. Today, we can complete the entire transaction online - buying (or selling) the shares, and updating the demat account or bank account; without ever moving from our desks.

In banking, we can now do a lot online – but largely within our own bank. Due to security concerns and regulatory caution, we're far from being able to complete all banking transactions online. While early adopters like ICICI Bank and HDFC Bank have matured products, the bulk of the banking sector (the PSUs) have implemented core banking IT solutions only in the past few years.

Insurance companies now have lots of insurance data, online checking of accounts, etc., on their websites. LIC even offers online premium payments, however, usage remains uninspiring. Mutual funds can now also be traded online, largely at SEBI's (Securities and Exchange Board of India) behest, but the off-take is disappointing.

The common thread across the sector is that though the technology platform now exists, adoption is far from encouraging.

ICICI Bank and Geojit Securities both launched Internet services at around the same time. They were quickly followed by several others, including HDFC Bank, State Bank of India (SBI), Indiainfoline and Kotak Securities. But today, ten years later, the stockbrokers are far ahead of the bankers, insurers and money managers.

By end FY2009, 349 NSE members (including all the largest brokerage firms) had permission to provide web trading to investors via NSE's trading system. Nearly 6 million retail customers were registered, and a trading value US $ 11.4 billion was routed and executed via the Internet. This was a chunky 10.6 per cent of all traded volumes in FY09.

Bankers are understandably, more conservative, as is the RBI. However, there have been islands of innovation. ICICI Bank leads in technology and Internet adoption. In 2000, 94 per cent of their transactions happened at branches, 3 per cent at ATMs, 2 per cent on the Net and 1 per cent via the call centre. Less than a decade later, in 2009; branch transactions fell to 13 per cent versus ATMs (46 per cent), Internet banking (38 per cent), mobile banking (1 per cent) and call centre (3 per cent).

The rising volume and reducing per-unit value of transactions have changed the operating context of ICICI Bank, which has reinvented itself to meet aggressive growth targets and rising transaction volumes, while maintaining service efficiency. In fact, this channel transformation strategy has been vital to its success in emerging as India's second-largest bank.

It helped that ICICI Bank, HDFC Bank and other private sector players are largely "urban" banks. Their public sector peers have a large number of branches in locations where population density, average incomes and education levels are lower. However, given the significant IT (core banking) investments over the past five years, we can expect rapid growth as PSU Banks have far greater reach. Expectedly, SBI is the most aggressive in trying to reach customers via alternate channels.

Interestingly, this has meant that the expensive brick-and mortar bank branch network has stagnated over the past few years, even as ATMs and other channels have seen double-digit growth.

Still Several Constraints

But before we get carried away, there are plenty of valid reasons for slow adoption of the Internet forfinancial services. Systemic risk and consumer protection (privacy, transparency, security, and investor protection) define the challenges for regulators and policy makers in financial services.

The security and privacy risks in the financial sector are of greater magnitude and sensitivity, than say, in selling books online.

Hence, in the Indian context, regulation or its absence has been the crucial driver. SEBI came into existence at the start of the digital era, and along with the NSE (National Stock Exchange of India), which was born digital, forced the BSE (Bombay Stock Exchange) and market participants were to jump in rapidly, or risk being left behind. In banking, the more cautious RBI has moved one step at a time.

Balancing security concerns with customer convenience is the big challenge for financial service providers. Even as competition from a new set of online players and more demanding customers are forcing a re-look at business delivery models, security and compliance issues only get magnified.

Data security continues to plague the Internet. Unlimited remote access can make a firm's network vulnerable to malware and virus attacks. It's easy to be critical of the non-adoption of fancy Web 2.0 technologies, but the truth is that most of the new technologies still have significant security flaws.

Another concern for the regulator is the threat from foreign providers or non-bank companies. Paypal offers many of the functions of a bank account, with a high degree of perceived safety and trust from customers. But its use is limited by the Indian regulator, as they are not registered as a bank in India. Nor are any other similar pre-paid systems or virtual currency systems allowed in the country.

Most countries restrict cross-border provision of financial services. But today, technology is far ahead of regulation, and there is considerable leakage. This also raises the issue of harmonisation of standards and practices – a tricky problem for the global financial community.

Drivers for Technology Adoption

As we have discussed earlier, technology adoption in the equity and public markets was under-pinned by several regulatory enablers – starting in the 90s. Financial sector reforms led to the Depositories Act and NSDL (National Securities Depository Ltd.) providing a vital backbone. NSE and then BSE went electronic and telecom allowed them to go truly national (and led to the extinction of regional stock exchanges). Suppliers of technology (like Financial Technologies) moved rapidly – and the wide availability of (increasingly commoditised) software has also helped. Today, every broker worth their salt offers some form of Internet trading.

And more recently, in 2010, we have seen the impact of regulation on the mutual fund segment, with SEBI mandated reforms forcing stock exchanges and depository participants to deal electronically in mutual fund units.

The country's demographic curve is also playing a part in improving banking penetration via new channels, with 65 per cent of the population still below the age of 30. Add to this, the trend of urbanisation – more than half our population will be urban in the next fifteen years or so.The changing consumer profile means more aware, more demanding and less loyal customers.

The growing young urban middle-class consumers are increasingly demanding better service. According to a 2009 ValueNotes survey of retail banking customers in India, 55 per cent of the respondents were willing to switch to another bank - for higher returns, lower fees or better services. Interestingly, 50 per cent of the respondents who said they'd consider shifting banks were between 25 and 36 years! Going forward, high quality online delivery will be crucial to keep up with the young, upwardly mobile, urban Indian.

Finally, and arguably the most compelling driver is reduced costs coupled with greater reach. It's not just about 'convenience', cost savings can be enormous. Studies estimate the savings (per transaction) at between 30 per cent and 60 per cent (or even more at higher volumes), as compared to brick-and-mortar banking. This is huge!

Reflections on the Dotcom Boom and Bust

Back in 2000, during the Internet frenzy, a large number of different start-ups catering to the needs of investors and traders came into being. Alas, as we all learned (the hard way); eyeballs and revenues were two different things.

Most went under, while others quickly adapted their business models to stay alive – which meant, for most, relinquishing their status as pure Internet plays.

Among the pure media (advertising driven) sites, moneycontrol.com has emerged as the dominant player. This has been driven by their association with CNBC TV18, which has enabled significant cash backing, free advertising (for them), cross-selling to the channel's advertisers as well as near-unlimited content. They are followed by the likes of Yahoo Finance, Google Finance and Rediff Money.

ValueNotes.com, though much smaller, has leveraged its unique position as an unbiased content aggregator to build a community and attract small-ticket advertising – even as the company's primary business shifted towards research services (ValueNotes.biz).

Equitymaster.com has managed to build a reasonably strong subscription model. They also own one of the most popular personal finance sites called personalfn.com

Capitalmarkets.com also went from free to a subscription model, which has survived even though their original brand (Capital Markets magazine) appears to have almost vanished.

Amongst those tracking mutual funds, sites like mutualfundsindia.com have lost out to data providers like Value Research, which has developed an extremely strong web presence with Valueresearchonline.com.

Trading based sites like indiainfoline.com and indiabulls.com morphed into brick-and-mortar brokerages and later into full-fledged financial services firms. In terms of current market cap, these two companies have been amongst the most successful of dotcom start-ups (even though they're no longer dotcoms). Most of the others (paisapower.com, hometrade.com, etc.) have fallen by the wayside – as online trading never lived up to the hype and they were not nimble enough to transform into traditional financial services companies.

A large number of traditional brokers built (and aggressively marketed) Internet trading sites, but most did not see much traction. The notable exceptions have been icicidirect.com (the market leader in online trading) and geojit.com. Today, Internet trading has become a hygiene factor, and most brokerages now provide this option. Interestingly, Internet trading has not translated into a growth driver (more customers), but has emerged as a cost-optimisation option – brokerages are encouraging customers to move online as this lowers the cost of servicing them.

Despite the difficulties faced by the early entrants and the lack of Internet penetration, in the past 2-3 years, we have seen a number of new entrants. These have been mutual fund focused (Funds India, Funds supermart) that see opportunity arising from SEBI's move restricting broker commissions or from the nascent, but fast growing insurance sector (policybazaar.com). Moneyvidya.com is leveraging Web 2.0 technologies to build communities, while MoneyWorks4me.com is banking on technology-enabled stock-picking for subscribers.

The jury is still out on these companies. However, in India, the Internet story is still to play out (the context of this chapter). Those that can successfully ride trends like Web 2.0 (social media) and mobile Internet could turn out as big winners.

Apart from transaction costs, customer acquisition costs, customer servicing and distribution costs can all be reduced by inducing more online transactions. Interestingly, as the number of users rise, the average cost falls – as variable costs are almost nil.

Public sector banks (PSB) are under immense pressure to improve efficiency, performance and competitiveness. The emergence of cost-effective alternatives to the branch - the ATM, Internet banking and now mobile banking can help them service their existing customers much more cheaply and efficiently. Now that IT investments are in place at all the big PSUs, the enabling infrastructure has expanded considerably.

But the Real Problem is Access!

Why do we expect the financial sector to invest in Internet technologies when there is so little reach?

Less than 5 per cent of Indians access the Net. A smaller number buy mutual funds and stocks. There's a good chance of intersection between these two groups, which is why we have seen greater adoption by the broker and investor community. However, 34 per cent of Indians have a bank account, and the bulk of them don't have Internet connections. About two-thirds of us don't even have bank accounts!

As the chart shows, usage and penetration of the Internet in India have been extremely low compared to many other countries.

Less than 2 per cent of the population have Internet subscriptions. As per an IAMAI-IMRB study, we had just 71 million "claimed" users in September 2009. This term applies to those who have at any time of their life used the Internet. Even the 52 million so-called "active" users, are defined as those who used the Net at least once in the last month. But is this anything to be happy about?

A person who connects once a month obviously does not even use email. How can we call these people Internet users? If we were to define 'real" users as those who log in several times a week, if not every day – the true numbers might be half or less, of the 50+ million number above.

Citing the large number of multi-user access points, some protagonists even claim more optimistic estimates! True, we have a lot of users connecting via office connections or cyber cafes. But we have a population of just 40 million PCs in India. And this is the core constraint. Too few access devices!

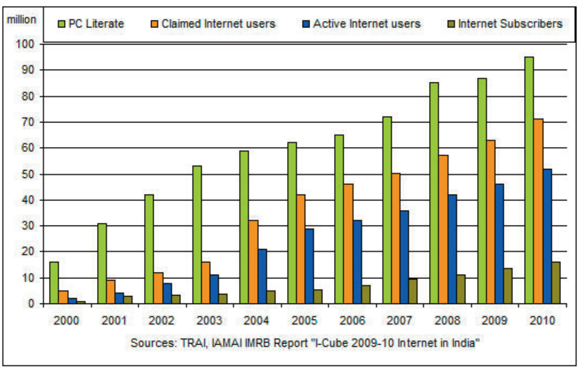
As far as commerce or finance is concerned, cyber cafes are unsuitable as few of us would ever leave behind bank or demat trails at a public access point. Shared space, hourly costs and uncomfortable surroundings all combine to deter usage.

Net usage and commerce cannot increase unless more people have a "personal" device to access the Net. Usage levels of 5 per cent of population are far too low. And that's after being generous in defining "active" as once-a-month usage!

The point here is that no matter what we do in terms of applications or conveniences, it would not matter very much, unless we can provide many millions of more Indians with an access device and a Net connection. Mobile presents the game changing opportunity.

Fortunately, this is where the paradigm has shifted. In August 2010, a whopping 670 million Indians had mobile phones! That's against less than 20 million Internet subscribers. In the next six months alone, we will add twice as many mobile users as the total number of Internet users!

It's a no-brainer. This is not about the Internet or the mobile phone - this is about a huge opportunity to truly accelerate financial inclusion. Just 35 per cent of our population has a bank account, but cell phone owners are almost double that number. More than 10,000 people share a bank branch or ATM; but collectively own over 6,000 phones. It won't be very long before half a billion Indians will own mobile phones but not bank accounts.



At the same time, growth of bank branches in rural locations is stagnating due to poor viability, and impedes conventional methods of financial inclusion. From the banks' perspective, the un-banked offer a huge opportunity – several billions every year, both from fees or services rendered, and indirect revenue arising out of the use of other value added mobile services.

With low cost, high scalability and finally, access to a vast majority of the population (more than that reached by television), the opportunity mobile offers is unparalleled. However, this means that part of the pie must be shared with network carriers, software and service providers and other non-banks. Not only is the RBI hesitant, banks are also worried that they might be dis-intermediated (even if only partly) by telecom or Internet companies, and RBI listens to their concerns.

However, protecting the old brick-and-mortar banking structure makes less and less sense. It's more important to bring every citizen into the financial system than it is to prevent telecom companies from becoming financial intermediaries. Of course, regulation is required, but ideally this should not keep any type of participant away, nor should it favour incumbents. Let's hope the RBI takes a visionary view!

More on the Future

Clearly the mobile (or smart phone) is the Internet device of the future. Its usability is being driven not just by hardware, but also adoption of new technologies such as Web 2.0, including social media. Tomorrow's customer will pull up a glorious, customised, mash-up of social networking, company and price information, research from our favourite analysts, gossip from the community, online trading at a touch, seamless access to multiple trading markets (like stocks, commodities, foreign exchange, bill payments, etc.), personalised advice, collaborative analysis – all in real time and in one interface – your phone!

We will see more and more DIY (do it yourself) financial consumers backed by better online information availability (aggregators) and data manoeuvrability (online tools). As we go along this path, I expect expanded availability of services in multiple vernacular languages – and with voice recognition built in. As easy as calling your mother-in-law!

At the back end, this will require standards and collaboration between the various types of providers. All the "clouds", such as the bank, the exchanges, the info providers, the brokers, the insurance company, the VAS providers; will have to talk to each other. And we, the public, will see only one large cloud… which we will access from our billion plus phones in 2015!

Of course, this needs some gutsy policy making. But I don't doubt that we will get there. The economic and social opportunity of including the un-banked is too large to be ignored. Especially when the means are now at hand, both literally and figuratively!

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Sunil Saxena

News Media

Yesterday, Today and Tomorrow

Editor's Note

This chapter covers the impact of the Internet on the news industry in India. In the 1990s, NRIs dominated Internet traffic on many news sites. Media sites started moving away from pure HTML pages to Active Server Pages (ASP) at around year 2000. Some major media houses set up independent companies to look after their Internet business. The site Tehelka.com shook India's defence establishment with its sting operation. The purchase of Baazee.com by e-Bay and JobsAhead.com by Monster in 2004 spurred Internet content activity in India. Broadband access gave a new lease of life to television websites. YouTube was the first major Web 2.0 site that caught the attention of Indian Internet users, followed by Wikipedia and Orkut. New social media startups include Bharatstudent.com, Minglebox.com, and Zapak.com. Many media houses now have their own dedicated short code for SMS news updates, which open up new avenues for monetisation. Internet adspend need to increase. Emerging frontiers include integration of tablet devices with mobile phones, and the rise of video content. The only factor in favour of traditional media will be its credibility.

The last quarter of the twentieth century was an eventful one for Indian media. The technology changed from hot metal to cold type before transiting to desktop publishing in the Eighties. It was not a very pleasant or smooth transition. But the print media grew on the back of new technology. New editions were launched across the country; the quality of printing improved; and there was a new stress on investigative journalism.

The liberalisation of the economy, which happened in early Nineties, was like icing on the cake. Adspends soared, and the industry grew. The arrival of private television channels added to the excitement.

Overview with Key Milestones

It was against this backdrop that the Internet arrived in India. It was a quiet arrival. In fact, the first years of Internet in India were virtually unknown and hardly noticed. First, ERNET (Education and Research Network), a division of Department of Electronics, and later, the National Informatics Centre (NICNet) and the Software Technology Parks of India (STPI) set up Internet hubs.

However, these were limited initiatives. It was only in August 1995 that India got its first public Internet service. It was provided by Videsh Sanchar Nigam Limited (VSNL), a Government of India undertaking. The service, named the Gateway Internet Access Service (GIAS), connected Delhi, Kolkata, Chennai, and Mumbai to the net. Later, Bangalore and Pune got hooked to the net.

Initial years: The initial years were frustrating. The dial-up connections were slow and broke down repeatedly. But this did not deter the Indian elite from acquiring these connections and logging onto the net. There was greater interest when The Hindu, The Times of India and The Indian Express set up websites. This happened in 1996. A few language sites, like Dinamani, also were set up around the same time.

However, it was the overseas Indians who were the main users of these sites. They logged in from America, Canada, UK, Singapore, Hong Kong, Australia and parts of Europe to know what was happening back home. The fact that the sites were low-tech and published the newspaper content which was one day late did not seem to bother them.

Those were early days, and the media was not much impressed. The general belief was that the web had a long way to go to become a mass medium. Companies therefore outsourced all website work - from designing to programming to hosting. American servers were used to host sites because India did not have any server farms.

Entry of private ISPs and dotcom boom: The turning point came in 1998, when the government took away the monopoly status of VSNL, and allowed the private sector to set up Internet infrastructure. The sale of Samachar.com to Satyam Infoway, for a much touted INR 425 crores and the purchase of Hotmail by Microsoft for US$ 400 million dollars injected excitement in the enviroment.

The arrival of venture capital and the ensuing dotcom frenzy during 1999-2000 made the media sit up and take notice. Three major media houses even set up independent companies to look after Internet business. These included The Times of India, The Hindustan Times, and The Indian Express.

The interest in the net was not limited to English-language media, but extended to regional media too. Websites were set up by most language dailies. Initially, the language fonts were a major issue. Some newspapers tried to overcome the problem by converting news reports into images, and publishing them. Later, web fonts were stored on the servers for users to download. The language newspapers also experimented with on-the-fly fonts developed by Bitstream, an American company.

The period was marked by a burst of activity both within and outside the media. The newspapers especially benefited from the advertisements released by websites like Baazee.com, Indya.com, Indiainfoline.com, Indiainfo.com, Hungama.com, My Iris.com, and Sharekhan.com. Indya.com, for instance, was rumoured to have spent over INR 4 crores on its launch campaign.

An important site that came up around this time was Tehleka.com. The site shook India's defence establishment with its sting operation. Another interesting development was the arrival of Internet giants/Yahoo! and MSN. Both set up Indian portals. Yahoo! also entered into revenue sharing deals with several media companies from which it sourced content.

The dotcom boom did not last long. But for the short period that it lasted it did create manpower problems for traditional media. Scores of journalists left newspapers for the dot-coms. At the same time, the media had to hire or train a new group of professionals whose skill sets were different from those of the existing ones. These professionals included web designers, web programmers and journalists who could edit and publish copy on the net.

The mood changed by 2001. Despondency replaced euphoria. Several high profile dotcoms went bust, and there were retrenchments and scaling down of operations. A depressed economy added to the woes of Internet enthusiasts.

Thenewspapertoday.com, a website launched by the India Today Group, tried to change the rules of the game by introducing a paywall in 2001. The development was watched with great interest by media websites. The hope was that all media sites could start levying a subscription fee if thenewspapertoday.com succeeded. But it was not to be. The website was shut down within months of introducing subscription fee.

Clearly, Indians, like the rest of the world, were not willing to pay for online content. No serious experiment was conducted after this setback, and most of the news content on the net continues to be free to this day.

Arrival of e-paper: The newspapers, at one point of time, hoped that the web users will pay for e-paper. The e-paper, which was launched around 2000-01, was the exact replica of the physical paper, and a big step forward on the "pdf-papers", which were nothing more than newspaper pages converted into pdf files and published on the net. The pdf papers were unwieldy, difficult to read and took a long time to download.

The e-papers, in contrast, came with several functionalities. This included search, better archiving and easy navigation. The credit of launching the first e-paper goes to The Times of India. After that, almost all newspapers, both in English and Indian languages, have launched their own e-papers. Multi-edition newspapers like Dainik Jagaran publish more than 30 e-papers every day.

But The Hindu is the only newspaper that even today charges subscription for its e-paper edition. The other newspapers experimented with subscription fee but gave up when they found that Internet users were not willing to pay. One reason for this was that the content available in the e-paper was also available on the newspaper website. Only the display was different. Another disadvantage of e-papers was that it did not allow updating. It was a static product, and carried news that was a day old.

However, one thing that must be said in favour of e-papers is that they are great archival products. They are especially invaluable for researchers and scholars who can go through e-papers from any part of the world.

Wire services: The wire services were a major beneficiary of the net. The Press Trust of India (PTI) and United News of India (UNI) realised early that Internet was another medium and demanded that newspapers and television channels pay separate fee for using their content on the net. They also found several new clients in the websites that were set up during the dotcom boom years.

Two young news agencies that saw potential in the new medium were ANI (Asia News International) and IANS (Indo-Asian News Service). Both these Indian news agencies modified their product offering to meet the requirements of news sites. ANI even launched a video service for the net in 1999.

The wire services were also quick to realise the kind of stories that were being read on the net. Almost all of them set up entertainment divisions to feed Bollywood content. But their greatest contribution to the net in India is the breaking story. The Home page of all news sites are dominated by breaking news stories moved by wire services.

Technology changes: The media sites started moving away from pure HTML pages to Active Server Pages (ASP) around 2000. The new technology allowed websites to create dynamic pages, which were database driven, could be updated more easily and archived more easily.

Also, by the turn of the century, Internet Service Providers (ISPs) began setting up server farms in Mumbai, Delhi, and Chennai making it possible for websites to be hosted in India.

Launch of broadband: By 2004, the mood started changing once again, this time for the better. The optimism was sparked by a slew of factors. The first was the launch of airline and travel sites. Air Deccan, India's low-budget carrier, set up India's first online booking site in 2003. It was followed by other airlines and soon a clutch of travel sites with large funding came up. Most of them chose media sites to advertise because they had traffic.

Two big ticket sales - the purchase of Baazee.com by e-Bay and JobsAhead.com by Monster - was another reason to bring back the smiles. A further push was provided by the government which launched the broadband in 2004. Till then, broadband or leased lines were very expensive, and could only be afforded by large business houses. The government made it possible for the middle class Indian to buy a broadband connection. The user experience improved – even though broadband was defined as 256 Kbps Internet line.

It gave a new lease of life to television websites. They could now post video files, and even consider launching streaming video. Two television channels that made full use of better connectivity were those of NDTV and CNN-IBN. They began posting more and more video files on the net. NDTV also launched a new arm – NDTV Convergence to harness the new technologies. Web portals like Rediff.com, Sify.com and IndiaTimes.com too started paying fresh attention to multimedia stories. Sify.com also launched Sifymax, a specialised multimedia section.

Media portals: An interesting development has been the foray of a few media houses into areas that are beyond news. The Times of India Group has been especially successful. Its portal Indiatimes.com is one of the highest trafficked websites in India, and offers a wide range of services. These include web mail, blogs, e-commerce, mobile content, web hosting, etc. The Group has also launched classified portals covering jobs, matrimonial and real estate.

Similarly, the Hindustan Times Group has forayed into areas beyond news. Its most important offering is Shine.com, a job and education portal. Like The Times Group, the Internet activities of The Hindustan Times are powered by a separate company, Firefly e-Ventures Limited.

In the south, The New Indian Express Group set up an independent company Express Network Private Limited to develop its web presence. Once again the brief of this company is to look beyond news.

Another important media portal with multiple offerings is Webdunia. Set up in 2000, this portal has been providing content in nine Indian languages. It has built considerable depth in managing Indian language content both for the web and mobile.

These forays may be few but they show the intent of media houses to play an important role in web space.

Impact of Web 2.0: The rise of social media sites in the US since 2004 has had an impact on India too. YouTube was the first major Web 2.0 site that caught the attention of Indian Internet users. Wikipedia was the next one. Orkut became a rage in 2006-07. By 2009-2010, Facebook, Twitter and LinkedIn began capturing Indian mindspace.

Every major Indian media today has a page on Wikipedia, and almost all of them are trying to use Facebook and Twitter to build a fan base. The objective is to reach out to the Indian users who have set up accounts on these two major social media sites. The media has also started mining Tweets and Facebook conversations to build news reports.

The media also scans blogs written by celebrities to develop news reports. Several publications like The Hindustan Times, The Economic Times and television channels like CNN-IBN encourage their staff members to write blogs. They even promote these blogs aggressively through onsite and offsite advertising.

It is not clear if this strategy is paying or not because unlike newspapers or television channels that have captive audience, the Internet users have a choice. They will visit only those blogs whose content is riveting or exciting.

Indiatimes, the web portal of The Times of India Group, also offers free blogging facilities. The Hindustan Times group increased its exposure in social media by buying Desi-Martini. The objective is to create stickiness, and build loyal traffic.

Social media offerings have also grown outside the traditional media. Bharatstudent.com has emerged as a top Web 2.0 player. The other social media providers, which were initially ridiculed as me too sites, to have made their presence felt are Froper.com, Minglebox.com and Zapak.com. Another important player in this space is Rediff.com.

Mobile content: An area where the traditional media is increasingly getting involved is mobile or wireless content. The Times of India was the first newspaper house to acquire a short code (58888) and launch mobile content services. It was followed by India Today, The Hindustan Times and several other media houses. Today, the majority of media houses have either their own dedicated short code or are using a shared short code.

Initially, the short codes in India were four digit numbers. However, the digit 5 was prefixed to all short codes in 2007 following a government order. Today, all short codes are of five digits and start with the digit five.

Most of the short codes are being used to move a range of pull and push-based news services for mobile phones. These include SMS-services like news alerts, forecasts, cricket scores, stock rates etc. There are several value-added services also that are being provided by media houses. These include ringtones, wall paper, dating, gaming, etc. The television channels have also been experimenting with moving videos on mobiles.

The media interest in mobile content was driven by two reasons. One, unlike web content, the mobile content could be monetised. The telecom companies shared 20 to 30 per cent of all revenue arising out of mobile offerings. The second was easy conversion. Media houses found it easy to leverage their strengths in news management to develop content for mobile industry. The auction of 3G spectrum in 2010, and the continued growth of mobile phone connections will continue to power media interest in mobile content.

The fate of WAP (Wireless Application Protocol) sites has not been so happy. The first WAP sites came up as early as 1999 or 2000. At that time, the handsets were not advanced enough to handle mobile content period. Nor was the bandwidth available for news content to be moved on mobile phones.

Most media houses revamped their WAP sites around 2008-09. These are now leaner, and more suited for being viewed on mobile phones. The web address of these sites too has now become standardised. However, there is no attempt to write content for these sites. Newspaper or wire copy that goes on the Internet sites of media houses also goes on WAP sites. This approach needs to be changed if the WAP sites are to take off in India.

Three Challenges and How to Overcome Them

1. Challenge: Low penetration: Internet in India is still to hit the critical mass. The Internet and Mobile Association of India (IAMAI) 2009-2010 I-Cube report on Internet in India estimates the number of Claimed Internet Users in Urban India at 71 million and Active Internet Users at 52 million[1].

Here, it is important to understand how IAMAI defines Active and Claimed Internet users. A Claimed Internet User, according to the IAMAI report, is an individual who has experienced Internet once in his/her lifetime. An Active Internet User is an individual who had accessed Internet once in the past month.

Clearly, these are not regular users of the net. The number of regular users would be even less. This can be estimated from the number of Internet connections. These numbers are also borne out by the figures released by the Telecom Regulatory Authority of India (TRAI) every month. The TRAI estimates show that there were 9.77 million broadband subscribers in July 2010. Another 6.2 million Indians log onto the net using dial-up connections. If each connection is accessed by five users on an average, then the total number of Internet users in India will be around 80 million.

Solution: India needs to improve its Internet infrastructure. This build up should not be in the field of wired Internet. The strategy should be to promote wireless Internet. Also, more and more public spaces should be made Wi-Fi enabled.

There should also be an effort to develop indigenised wireless devices like iPad or Kindle. They should be affordable, and empower more and more Indians to logon to the net wirelessly.

2. Challenge: Insufficient advertising revenue: The media sites are caught in a vicious circle. They need revenue to expand. To get revenue they need visitors. But this is not happening. The number of Internet users in India is still too low to interest advertisers.

To compound the problem of media sites, a large number of their visitors still come from abroad. These numbers are particularly high in the case of language sites. According to rough estimates, almost 60 per cent of traffic to Tamil, Telugu or Malalyalee sites is made up of non-resident Indians.

Growth of the Indian Internet Advertising Industry

In Rs. billion	2004	2005	2006	2007	2008	CAGR 2004 - 08
Internet Advertising	0.6	1.0	1.6	2.7	5.0	69.9%
% Change		*66.7%*	*60.0%*	*68.8%*	*85.2%*	
Internet share in ad pie	0.5%	0.8%	1.0%	1.4%	2.3%	44.8%

Source: Industry estimates and PwC analysis

The NRIs may swell the number of unique visitors but they also turn off domestic advertisers. This is why the Internet adspends are so low. The latest PriceWaterhouse Coopers study[2] shows that Internet advertising grew from INR 0.6 billion in 2004 to INR 5 billion in 2008. In contrast, the Indian advertising cake grew from INR 113.6 billion to INR 216 billion in the same period.

Clearly, INR 5 billion is not enough to sustain the media and their dependence on their parent companies will continue. Long as this does not change, no dramatic changes can happen.

Solution: The low domestic traffic is not the only reason for poor advertising revenues. Internet advertising in India is performance-linked. The advertising networks and advertising agencies sell Internet advertising on cost per click or cost per sale basis. Some advertising is also sold on the number of page impressions.

This advertising model is in favour of advertisers. They get extensive exposure on the net, but pay a fraction of the amount they would have paid for similar exposure in print or television channels. It is important that agencies move out of the model. The companies should be told that Internet advertising too is building their brands. The charges, like print or TV, should be based on brand building and not on actual sales. This should lead to a substantial increase in revenue even on the current traffic.

3. Challenge: Absence of web reporting teams: It is remarkable that none of the established media houses have reporters dedicated to generating news reports for the web. The strategy is to buy copy from wire services to provide latest and current news. Often, the websites of top newspapers and TV channels look like clones of each other because they carry the same stories. Even the headlines, at times, are the same – because the wire service headlines go unchanged on the net.

The fear in most newsrooms is that you can't allow your rivals to scoop your stories. The policy is to print a good news report in the newspaper or broadcast it before publishing it on the website. The websites, therefore, have not been developed as primary sources of information.

The traditional media still shovels newspaper and television content on the net. The content is written for another medium but is still pushed on the net.

Solution: The web should be looked upon as an independent news medium, and news reports developed specifically for it. Even the product mix needs a relook. News reports run as top stories in newspapers or television channels often attract no audience on the net. This is evident from the most read, most commented or most e-mailed stories. These stories, which the computer algorithm filters based on story downloads, often are different to stories that traditional media editors consider important. The media needs to take a note of this, and develop a different product mix for the web.

Media 15 Years from Now

Social Media

The new traffic nodes on the net today are the social media sites. They are being used by millions of Indians to create, publish and share content. According to an August 2010 study[3] of social media sites in India done by comScore.com: "More than 33 million Internet users age 15 and older in India visited social networking sites in July, representing 84 per cent of the total Internet audience." This movement is going to gain momentum in the coming years. It will not be surprising to see more and more Indians start their web journey from social media sites.

This will also impact the way news is delivered. Few web users will visit the news sites to browse news. Already, the more net savvy Indians are using RSS feeds and Google News keywords to filter news of their interest. They get this content in their RSS Reader or e-mail box saving them the need to scour scores of news sites.

However, in the years to come this filtration may be considered inadequate. We must accept that computer algorithms cannot substitute human intelligence. The needs of each human are unique, and keyword-based filtration will give way to human recommendation.

We are already seeing the first signs of this change. Social media sites like Facebook and Orkut are providing tools where groups of individuals with common interests share content that they like. This filtration is sharper, and better focused. Members are not flooded with scores of reports on the same subject. A human mind has narrowed down the choice to one or maybe two reports.

The web-based news media will have to adapt to this reality. They must start accepting the fact that they will not be in a position to tell readers what they should read. The era of one-to-many will finally end. It may even mark the end of the news websites as we know today.

News entities will migrate to social media sites to disseminate information. Even today, we are witnessing the phenomenon of media sites launching fan pages on Twitter and Facebook. It is an acceptance of the fact that the world is moving into the many-to-many mode.

Wireless delivery of content

The desktop, also sold as personal computer, will become history soon. With it will disappear the need to deliver content on wires. All content in the coming years will be delivered, and accessed, in the wireless mode.

Today we see more and more Indians switching to laptops, and logging onto the net with the help of external data cards. Soon, we will witness wireless devices such as Kindle and iPads gaining traction in India. These will be powered by internal or external cards to access data on the move.

The next logical step will be integration of content devices like laptops, Kindle or iPads with communication devices like mobile phones. Such integration will move all human communication – both one-to-one and many-to-many – on a single device.

These devices will take away two major limitations of mobile phones. One, they will make content creation easier; and two, they will make content display better.

The traditional and web-based media will have to rethink its strategy to meet the news and information needs of this market. This audience will need content in real time, and in formats that are interactive and can be shared.

Video to dominate content mix

The world will gradually move towards devices that can access video content in real time. According to the Cisco Visual Networking Index[4] : Global Mobile Data Traffic Forecast Update, 2009-2014, "Globally, mobile data traffic will double every year through 2014, increasing 39 times between 2009 and 2014. Almost 66 per cent of the world's mobile data traffic will be video by 2014."

The study further states that 70 per cent of this traffic will move on laptops and other mobile-ready devices; 21 per cent will move on smartphones, 5 per cent on home gateways and 4 per cent on non-smartphones. This is a good indicator of what kind of content will become popular in the coming years.

Much, of course, will depend on access devices and transmission technology. But what is clear is that the world will move from text-based content to audio-visual or video content. The media will have to change its strategy to retain its market share.

The biggest threat to media will come from individuals who will generate video content, and publish it in real time. It will be impossible for any media to match the volume of content that millions of individuals can create. More importantly, these individuals will create content from actual locations – that is their actual sites – that is their stories will be eyewitness accounts of concerts, calamities, public events, market launches etc.

This was the sole and exclusive preserve of traditional media so far. The cost of news generation was so high that a handful of organisations controlled content flow. This control will be shattered.

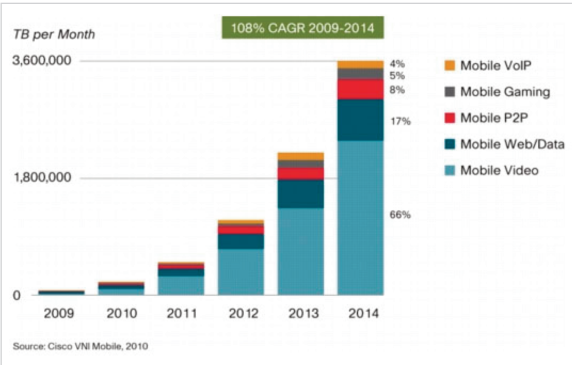
The only factor in favour of traditional media will be credibility. The media, over the decades, has built strong checks and balances, and these may prove to be powerful differentiators.

Job profiles

It is hard to visualise media without its own content generation team. After all, it is this key function that gives media its reach and power. But with every individual in a position to generate news, and that too eyewitness accounts, this key power of the media will gradually diminish.

The media will be better served if it develops an army of what it today patronisingly calls citizen journalists. The more people it has on ground, the better will be its reach and coverage. This will be a loose and unstructured network of reporters, who will function as the eyes and ears of the media.

The reports of these street-level journalists will be vetted by a team of editors before being put out on the net as authentic or credible content. There will be a shift in newsroom power structure. The content processing editors will become the key functionaries who will sift, filter and process the flood of content for the receiving devices.



Even here there will be two separate teams. One team of content editors will be skilled in processing audio and video content. The other team will process text and images. Both these teams will be supported by a backend team of researchers whose job will be to provide depth and range to content. The research editors will also be used to cross-check the veracity and authenticity of content received from the field.

All three teams will work under the guidance of Coordination Editors, who will interact with the individual citizen reporters on the ground, the content editors in the newsroom and the research editors at the backend. The goal will be to produce credible content in as little time as possible.

News cycle

The news consumption patterns will undergo a dramatic transformation. Today each news product has its own news cycle, and a clear time slot when it is consumed. The morning editions of newspapers are produced with the clear objective of providing news for consumption between 6 to 8 am. The breakfast television has a short news cycle of 8 to 9 am. The news alerts on mobile phones are popularly consumed between 10 am to 8 pm. The radio is no longer an important news source in urban India though there was a time when the 9 pm radio bulletins had a large following. This slot has now been captured by television.

Interestingly, the Internet has no clear browsing time. It varies from audience to audience, and differs across different age groups. In a way, it can be said to be a precursor of the things to come. There will be no news cycle as the world moves towards a converged device where all content is being moved wirelessly. This content will be in real time, and constantly updated. The end-consumer will browse this product on his or her convenience.

The pressure on media organisations will mount. Today they know their prime consumption hours and prepare their products accordingly. Fifteen years from now, they will not have this luxury. They will be working in a medium which is always on, and always hungry for information.

The media will have to reinvent itself to meet its needs.

References

[1] *Internet and Mobile Association of India study titled I-Cube 2009-2010 Internet In India*
url: http://www.iamai.in/Upload/Research/icube_new_curve_lowres_39.pdf
[2] *Online Advertising in India from 2004 to 2008*
Source: Pricewaterhouse Coopers report Indian Entertainment and Media Outlook 2009,
[3] *The top ten social networking sites in India in July 2010*
Source: comScore.com
url:http://www.comscore.com/Press_Events/Press_Releases/2010/8/Facebook_Captures_Top_Spot _among_Social_Networking_Sites_in_India
[4] *Wireless devices that will be used to access data.*
Source: The Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2009-2014, Cisco.com
url:http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html

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Chapter 19

Keval J. Kumar

Terrorism, Critical Media Pedagogy and the Internet

Editor's Note

This chapter observes that as compared to the galloping pace of growth of mobile telephony, the Internet growth is rather tardy, especially when compared to Internet growth in China. The rise of the Internet has given rise to a new language, and to new meanings for familiar words and phrases. The author jokes that UGC does not mean University Grants Commission but rather User-Generated Content! In addition to media literacy, there is now an international movement in computer literacy. The chapter also urges for critical pedagogy approaches in areas like checking for credibility of sources on the Net, use of advertorials, and dealing with spam. The Internet has become an invaluable resource for both lecturers and students; how it is made use of by teachers will depend on the strategies of their media pedagogy. Challenges are emerging with some mainstream bloggers pitted against the independent ones. Other challenges that arise are in using ICTs to provide economic opportunities to women, dalits, and other marginalised groups.

It's the peak season of religious festivals in Pune, Western India, as I start this critical reflection on the Indian experience of the Internet over the last decade or so. Ten days ago, we celebrated both Eid-ul-Fitr and Ganesh Chaturthi, coincidentally on the very same day. Today is the grand finale of the Ganesh Festival when the immersion of almost a million Ganesh idols takes place in rivers, lakes, tanks and other water spots. For two full days, the whole city closes down for the public worship of the elephant god. This religious-cultural festival is more than a hundred years old, having its origins in the national movement for Independence from British rule. It was Lokmanya Tilak, the freedom fighter and founder-editor of Kesari (initially published in English and Marathi, but now only in Marathi), perhaps Pune's first daily newspaper, who urged the entire population to come out on the streets and celebrate the festival, in a show of public unity against the alien regime. Just about a month away is Navratri and Dussehra, closely followed by the festival of lights, Diwali or Deepavali, and later by Christmas and New Year. This year, the Indian Premier League (IPL), the many cricket tests and one-day T-20s and the Commonwealth Games have added to the celebratory spirit. It thus appears that the city (and the country) is in celebration mode around the year. That celebratory spirit is also to be found on the Internet, with a host of websites and blogs inviting surfers to participate in the various Indian festivals.

However, this festival season since the attack of November 26, 2008 on landmark hotels in Mumbai has often been marred by rank commercialism and the constant threat of terrorist attacks. The police are out in full strength and so are the Rapid Forces for Disaster Management; the armed forces are on high alert. Here are two SMSs I received from the Commissioner of Police, Pune, during the current season:

> *'For safety of the city, inform about abandoned vehicles or unattended objects or suspicious persons on number 020100 or 02026122880.'*
>
> *'For joyful Dussehra and Deepavali, be an alert citizen. Inform police about suspicious activity or abandoned article/vehicle on phone no 100 or 0202612280.'*

What is interesting here is the use of communication technology for keeping in touch with the public. The police do not use bulk emails via the Internet or the traditional technologies like radio, television or the cinema but rather the textual facility on the mobile phone. It is clear that the mobile phone is the preferred technology for making public announcements and alerting citizens since it is certainly the most widespread medium today in India; more than 670 million mobile owners and with 15-20 million new subscribers added every month. As compared to this kind of access to mobile telephony, barely 81 million use the Internet regularly; the growth rate of access to the Internet is barely 10 million per annum.

Ironically, it is this widespread communication technology that has also become a weapon in the hands of local and cross-border terrorists. The SIM card and the mobile phone have turned out to be the most widely used devices or 'timers' to set off homemade and more deadly bombs at shrines, markets and trains.

Further, terrorist groups are active on the Internet. They not only propagate their philosophies and grievances on the net but are active in promoting hate-speech and deface websites and blogs that do not support their causes. Thus, the al-Qaida, the Lashkar-e-Toiba and other groups are active in the sub-continent in the hope of increasing their ranks and preaching to their followers.

This chapter examines the reasons for slow growth of access to the Internet in India in comparison to the galloping pace of the growth of mobile telephony. This is followed by a look at the Internet as a business and the role that advertising plays in that business. This leads me to a personal account of my experience of using the computer over the past two decades and a half and of how the rise of computing and the Internet has given rise to a new language. Finally, I consider some of the implications of the growth of the Internet for Media

Education/Literacy, Computer Literacy and critical media pedagogy in Indian schools and colleges.

Tardy Growth

Several recent surveys of Internet use in India (Cf. Kohli-Khandekar: 2010, Business World: 2010) point to the tardy growth of this communication technology in everyday life on the sub-continent. None of these surveys estimate the number of 'active users' to exceed a hundred million. ('Active' usage is defined as the surfing of any site or blog or social network at least once during the past week).

How is it that the Internet has not really taken off in India on the mass scale it has in China? The biggest hurdle of course is the erratic supply of electricity in most parts of the country. Even large cities like Pune and Bangalore often shut down for three-to-four hours per day, particularly during the summer months. There has been little progress too the provision of broadband access. Though the overall tele-density is as high as 58.17 per cent, with the growth rate of 16 to 18 mobile phones per month, the growth of broadband access has been a measly 0.2 to 0.3 per cent (Siddhanta: 2010). Thus broadband penetration stands at a mere 0.8 per cent. According to Department of Telecommunications (DoT) Study, the total number of broadband users in 2010 stands at 9.77 million, as against the set target of 20 million (ibid.). DoT cites two reasons for the slow pace of broadband penetration: the first is the slow growth of laying of optic fibre cables; the second is the time-consuming process of securing RoW (Right of Way) from multiple agencies (ibid.). RoW charges require an additional Rs. 34,380 crore (ibid.). Further, the broadband market is dominated by Bharat Sanchar Nigam Limited (BSNL) which holds 56 per cent of the rather fragmented market of 104 service providers. However 95 per cent of the market is corned by the ten top players (Chaudhari: 2010).

Then there is the high cost of accessing the Internet outside offices, educational institutes and public-access information kiosks or telecentres. Mazar (2010) estimates that there are over 300,000 'citizen-centric telecentres in the country; this figure includes around 180,000 cybercafes. Further, around 85,000 Common Service Centres (CSCs) have been set up; it is expected that over 250,000 would be established, one in every panchayat of rural India (ibid.). The Indian Telecentre Network (ITN), an initiative of GlobalTelecentre.org, and Digital Empowerment Foundation, is spearheading this attempt to take the Internet to the furthest corners of the country. But inexpensive and easy home access to the Internet remains a pipedream for the majority of the population.

However, despite this tardy growth of the Internet in India, it is proving to be a profitable business. According to one estimate (Kohli-Khandekar: 2010, p. 250) the Internet is a INR 57 billion business, of which INR 11 billion accrues from advertising revenues. The global Internet business was estimated to be worth US$ 253 billion according to a Pricewaterhouse Coopers' study (Quoted in Kohli-Khandekar: 20120, p. 250). Table 1 below illustrates how online advertising has risen over the last three years and what the estimates for the future might be. Table 2 indicates which sectors of business are spending on online advertising.

Computing in the Early 1980s

When I began computing in the early 1980s, the keyboard was no different from the QWERTY of my typewriter. To begin with, the computer (the PC came much later) was for me just an advanced typewriter. Those were the days when Apples, Apricots, and Tangerines (yes, these were indeed the 'fruity' brands of the time) didn't 'talk' to each other. If you were to save your Word perfect files on a floppy on one computer brand, like an Apple, you could not open them on a rival brand. There were no 'windows' or 'icons' to distract you, neither was there a 'mouse' to click or drag around; the QWERTY keyboard reigned supreme. No wonder then that in those halcyon days of the computer everyone was a 'programmer'! So, if you needed to use the statistical package SPSS, you had to spell out in line after line what you wanted the software to calculate. So, if you wanted SPSS to estimate the frequencies for you the full instruction 'FREQUENCIES' followed by the variable names (no more than eight characters each) had to be spelt out. Thus, 'Television Ownership' had to be abbreviated to 'TVOWN' and the demographic 'Occupation' to 'OCCUPAT'. And again, if you wanted to do cross-tabulations, the command had to be reduced to, for instance, 'CROSSTABS TVOWN BY AGE'.

TABLE 1: Growth of Online Advertising in India

Year	In Crores	Per Cent of Total Ad Spend
2008-2009	Rs. 16,289	2
2009-2010	Rs. 18,951	4
2010-2011 (Estimate)	Rs. 21,523	5

TABLE 2: Commercial Sectors Spending on Online Advertising

Commercial Sector Advertising	In Crores	per cent of Online
FMCG	Rs. 56 Crore	9 per cent
Banking, Finance & Services	Rs. 114 Crore	19 per cent
Consumer Services	Rs. 108 Crore	18 per cent
Information Technology	Rs. 79 Crore	13 per cent
Telecommunications	Rs. 70 Crore	12 per cent

(Source: Digital Media Outlook 2010, Quoted in Mint, October 7, 2010. pp.12-13)

My first PC (Portable, not Personal, Computer) was a second-hand , sold to me by a British professor-friend; it cost me no less than a thousand pounds sterling. It was only in the late 1990s that I was introduced to Email and a couple of years later to the World Wide Web (www) and the Internet. However, most of us could still afford to subscribe to bulletin boards and Email on our own; the subscription rates were truly exorbitant since the few companies that offered this new service were based in Bombay. Thus began the strategy of 'shared Email ids' where two or three friends got together and shared a common id and of course a password. Those days are long past: I now have as many as five Email ids! Meanwhile, I have heard to learn a new language, which perhaps could be termed 'Internetese' or simply 'computerese'.

Today, I use my laptop to watch films, videos, television news of my choice, and to read the newspapers and magazines of the world. The mouse or the touchpad is my window to the digital world; it's a cornucopia I can barely manage. But that joy of surfing the borderless Internet is endlessly interrupted by pop-ups, banners, buttons, junk-mail, spam.

The New Language of the Net

The rise of the Internet has given rise to a new language, or at least to new meanings for familiar words and phrases. Netizens (citizens on the net, but not necessarily of it!) now 'surf' the web, not 'the waves' as an earlier analogue generation did. The 'web' is no more something that is spun, with connotations of cunning and deception; these nuances have now practically disappeared. The web is now just an innocent global network of networks with no hint at all of entire citizens ever being 'caught' or 'trapped'. The selfsame netizens 'chat' on the web, but don't say a word! They merely spell words out. If they do really want to chat they turn to 'Skype', the free online phone, though to tell the truth, there's nothing really free on the net.

They form 'groups', 'forums' and 'communities', but have hardly seen each other in the flesh; they make 'friends' in what are called 'social networks' (as though there are no such networks off-line) and when they are tired of such friends, they 'un-friend' them! (On your mobile phone, such friends and relatives are called 'buddies'). But all these, in reality' are just 'virtual'; even 'fan pages' and 'fan clubs' are similarly ethereal. But there is nothing more ethereal than 'clouds' which will soon store all your files and applications. We can then do away with so-called 'hard disks', floppy drives, CD drives, 'motherboards', pen drives, the lot. That will be an environmental revolution where 'e-waste' will hopefully be a thing of the past. 'Viruses' and 'junk-mails' though will remain the most irritating pests in cyberspace. Is there anyone 'out there' who will rid us of these 'bugs'? Let's hope that 'debugging' comes to the rescue; what with so many anti-virus companies in every nook and cranny of our IT cities this is surely not asking for too much. One suspects that it is these very companies that are disseminating the 'bugs' around the world's computers, and getting away with it. This is what advertisers and other publicity agents like to call 'viral marketing' tough in altogether another context.

Further, UGC is not your University Grants Commission in New Delhi, but rather 'User-Generated Content) which is 'uploaded' on blogs, microblogs, YouTube, Flickr and so on.

And RSS is certainly not that detestable fundamentalist white-shirt-khaki-pants stick-wielding soldiers' organisation but merely 'really simple syndication' on the net; just a little aggregating device that saves you the bother of checking every newspapers' website to find out the latest developments. Similar aggregators have even more fancy names: delicious (often broken up by dots), dig the works.

The latest development in the language of the net is in the area of metrics. What by the way is a 'page impression' or a 'hit' or a 'click'? Do these mean very much where involvement and engagement in the content is concerned? How reliable indeed are such attempts to measure activity on the Internet? My browsing of the four recently published volumes on 'Internet Marketing', 'Social Media Marketing', YouTube and Video Marketing and 'E-mail Marketing' published by Wiley-India and The Times Group (2010), did not, I am afraid, provide me any convincing answers. I still have no idea of what's going on in that little black box (otherwise called the brain) of netizens as they mail, game, surf, browse, blog, google, wiki, binge, hit, click, post, tweet and phish! (And have you noticed that the exclamation mark has, after a lapse of several decades, gained a new respectability in all the new media?)

Media Education and the Internet

Until a few years ago, the Media Education or Media Literacy movement which made a mark in schools and colleges was hailed as a brave attempt to introduce education about the mass media into the formal education system. The goal of Media Literacy was not so much to turn out media professionals but rather 'critically aware' users of the different media. Such users would be educated to de-construct the meanings of the media, analyse the politics and economics of the working of the media, and in the process would be empowered to question and even resist the

ideology of media organizations. Thus the focus of Media Literacy had been on the social, cultural, political and economic implications of the media business.

There is now a need for an international movement in Computer Literacy, with the focus this time not on the mass media but on the new digital media. This is not to be confused with turning out hardware and software engineers. Rather, Computer Literacy raises questions about how digital content is constructed, how capital and ownership and advertising shapes programming and content, and how surfing audiences around the world make sense of the multimedia digital texts.

Take Google News, for example. News reports and features from American newspapers, as also from radio and television channels are invariably at the top of the aggregated listings. Not surprisingly, Voice of America (VOA), which incidentally, cannot be legally listened to in the United States, gets top listing on Google News on several occasions. US sources invariably come out at the top; only in news.google.co.in do Indian media have pride of place.

Most Indian newspapers, magazines and television channels have extended their media properties to Internet where they take on a digital presence. The digital versions attract a huge NRI audience: over 22 million in around a hundred countries of the world. This perhaps explains why there is extensive coverage of news of NRIs and their achievements (or crimes) in the Indian media. This coverage, in turn, brings in overseas advertisers and sponsors for classified advertising, job sites, travel sites and above all, matrimonial sites. Computer Literacy, like Media Literacy earlier, raises questions regarding the influence of commerce and target audiences on content, and most crucially of how credible such content is.

Critical Media Pedagogy and the Internet

Internet has also revolutionized media pedagogy or what is now termed 'critical media pedagogy'. The lecture method has become redundant,as wellthe participatory seminar where students make presentations on selected topics to fellow-students and faculty, with interventions and rigorous question and answer sessions in which both students and faculty join in. The lecturer's job thus not so much to deliver lectures from a podium but rather to ask challenging questions on issues raised by the presentations. Since much of the basic information is available on the net, the role of the lecturer is not that of an information provider but that of an interpreter and critic, of introducing different perspectives to the issue under discussion; that role also extends of demonstrating how to check for credibility of sources on the net: how credible, for instance, are sources from Google and Wikipedia. Key questions on the difference between what is information and what is public relations, advertising and propaganda, need to be raised. Certainly, the net is flooded with promotional material that has no bearing whatsoever with facts and truth.

The critical methods thus need to be evolved on how to distinguish one from another. This leads us to looking at discourses and the politics of language and images. Critical media pedagogy demands the analysis of 'deep structures' and the ideology embodied in media constructions. User-generated content (UGC) on YouTube, twitter and the millions of blogs and posts that are uploaded and shared on the net are crying out for critical analysis from a plurality of perspectives. The contemporary college lecturer is thus an 'animator' and moderator in the classroom rather than a pedagogue who is an expert and has all the answers to every question. The Internet has become an invaluable resource for both lecturers and students; how it is made use of by teachers will depend on the strategies of their media pedagogy.

Take news search engines, for instance. Students of journalism regularly surf these sites rather than read the newspapers. Two sites which aggregate news in English and several Indian languages have proved to be the most visited. The first is Google News or news.google.com which provides quick access to the world's news papers, radio and television news, country by country. News from several Indian newspapers and television news channels can be accessed, though The Hindu, The Times of India and The Hindustan Times appear to be at the top of most lists for 'India'. Google News also offers aggregated news from Hindi, Tamil, Malayalam and a number of other Indian language newspapers. The focus, though in the Indian language channels is local news.

The second popular site for Indian news in English and a clutch of Indian languages is www.samachar.com. Beginning as an aggregator of news from the English press, this news website and search engine has been transformed into a multi-lingual portal which now attracts a host of advertisers. The media educator will raise critical questions about the way such news aggregators prioritize and construct the news and thus attempt to set the agenda for public information. What is the role of the advertisers in this selection process? Is soft lifestyle news favoured over hard news because this is the news environment the advertisers support? A look at kind of news highlighted in the home pages of www.yahoo.co.in or www.msn.co.in clearly testify to this bias towards soft news.

In contrast have a look at the alternative news sites and newsblogs in India such as merinews,com, cplash.com, whitedrums.com, mynews.com, merikhabar.com, purdafish.com and the Viewspaper (Ranganathan: 2010, p.112). These sites and others like www.indiatogether.com and www.thehoot.org approach news as a public resource and a public good, encouraging what might be termed 'citizen journalism'. But this attempt to provide alternative perspectives and to critique practices of the mainstream media is frequently under threat, not just from government and fundamentalist groups but from the mainstream media too. The Times of India Group, for instance, used its clout to silence bloggers like Pradyuman Maheshwari (mediaah.blogspot.com) who dared in 19 posts to question practices like 'MediaNet' (a form of 'paid news') by sending him a legal notice (Cf. Ranganathan: 2010, pp.235-236). And NDTV, the news channel, went to the defense of their senior reporter, Barkha Dutt, against bloggers like Chyetanya Kunte by slapping them with legal notices (ibid.). Much of the mainstream media remained largely indifferent to such bullying practices. The critical media educator debates these and similar issues in the classroom in order to raise awareness about these threats to the freedom of expression in our democracy.

In contrast, the use of the Internet by Naga nationalists to speak up for their struggle against the Indian state has gone largely unnoticed. That struggle receives little or no coverage in the mainstream Indian media. Two of their websites, www.nagalim.nl and www.nagarealm.com discuss the history of the Naga tribes and the formation of the state of Nagaland as part of the nation-state of India. The websites spell out the demands of the Naga people, the primary demand being the establishment of an independent Greater Nagaland, or what the second website terms Greater Nagalim (Cf. Ranganathan: 2010, p. 131). This 'resistance movement' is an instance of how the Internet can be transformed into the public sphere, 'the commons' where the peoples of the world meet to freely discuss and deliberate on global and local issues that beset mankind.

The Future of 'The Commons'

Several public and private sector organizations have sought to tap the potential of information and communication technologies (ICTs) for national development. Rogers and Singhal (2001) present a heartening account of the success of what they call 'cyber-marts' in rural India. More than 5,000 'e-Chaupals' have been set up by ICT which have been instrumental in disseminating timely information to 3.5 million farmers in 35,000 villages about prices (in local, national and international markets) and also in curtailing the role of the middle-man in the distribution of products.

Three recent edited compilations describe some of these attempts from different parts of the country (Cf. Bhatnagar and Sechware: 2000, Pringle and Subramaniam: 2004, Parayil: 2006). Sreekumar's study (2007), however, takes issue with these enthusiastic accounts of the role of ICTs in rural development. In his critical analysis of three typical projects to bridge the digital divide, two private and one state/district government, he sheds light on the grassroots problems involved. The three projects in using 'cyber-kiosks' to provide economic opportunities to women, dalits and other marginalized groups as well as to enhance their participation in the democratic process and in e-governance, were: (i) Village Knowledge Centres (VKC), established and promoted by the M.S. Swaminathan Research Institute (Puducherry), (ii) TARA Kendras, by a group called Development Alternatives, with cyber-kiosks in Bhatinda (Punjab) and Bundelkand ((Uttar Pradesh); and (iii) Gyandoot Soochanalyas (Information Centres), set up by the district administration in Dhar (Madhya Pradesh). All these three projects have won international acclaim and several awards for their development enterprises. However, Sreekumar (2007) found from his close observation and interviews at the three centres that discrimination in terms of caste and gender regarding access and use persisted and that higher castes and men grabbed most of the resources and the economic opportunities. Thus, the power-structures at the grassroots rural level continued to determine access to the cyber-kiosks in rural areas.

Other attempts to take the new media to the grassroots level have been more successful. For instance, the various help-lines for women, children, students, the elderly and disadvantaged groups have done well; together with landlines and mobile phones, websites, blogs and email contacts have facilitated prompt assistance to those in need. The Right to Information (RTI) Act has certainly empowered NGOs and Social Action Groups. Complaints against officials who ask for and demand bribes can be made online or on mobile phones. For instance, the Bangalore-based not-for-profit website www.ipaidabribe.com launched by an ex-civil servant has been making waves in its exposure of corruption in high places. Further, alternative news websites such as www.indiatogether.com, www.infochangeindia.com and www.thehoot.org have pioneered the monitoring of the performance of the news media.

In the coming years it is expected that much web surfing will take place via the mobile phone. That is of course dependent on the tariffs charged by the telecom companies and the Internet service providers. There is little doubt that the four delivery platforms, telecommunications, Internet Service Providers (ISPs), cable operators and television channels will soon converge and serve one 'pipe' for media and entertainment content. Further, 'pay-per-view' (PPV) could become the norm on all platforms and the single convergent platform. It is therefore recommended that telecom companies collaborate with DoT (Department of Telecommunications) and TRAI (Telecommunication Regulatory Authority) to hasten the development of nationwide broadband access; this of course must be a public service offered free, as is the case with several welfare-state based democracies. A key issue to Internet access is the question of copyright. As the Coy/Left movement has shown, copyright holds up quick and easy and free access to the world's knowledge which is seen as a public resource and a public good. Thus information and knowledge should form part of the 'commons' that we all share in equal and fair measure of citizens of an inter-connected world. Undue profiting from copyright restricts freedom of expression, the right to communication and the right to information – all, incidentally, fundamental rights. Policy makers, media and industry leaders should come together in this global mission to preserve the 'commons'.

Resources

Bhatnagar S and R. Sechware (Eds.): Information and Communication Technologies in Development: Cases from India, New Delhi: Sage. 2000.

Pringle I and S. Subramanian (Eds.): Projects and Experiences in ICT Innovation for Poverty Reduction, New Delhi: UNESCO. 2004.

Parayil G (Ed.): Political Economy and Information Capitalism in India: Digital Divide, Development Divide and Equity, Basingstoke: Palgrave Macmillan. 2006.

Business World (2010): The Marketing White Book – 2009-2010.

Chaudhari, Anindya (2010): 'Broadband Policy: What Do We Know? What Do We Need to Know?', Economic and Political Weekly, September 18, pp. 36-43.

Rogers, Everett and Arvind Singhal: From Bullock-Carts to Cyber-Marts: India's Communication Revolution, New Delhi: Sage. 2001.

Kohli-Khandekar, Vanita (2010): The Indian Media Business, New Delhi: Sage Publications. 3rd Edition.

Kumar, Keval J. (2010): Mass Communication in India, Mumbai: Jaico Books. 4th Ed.

Mazar, Sundar (2010): 'Indian Telecentre Movements Sustainability a Source of Concern', Mint, October 25. p. 25.

Ranganathan, Maya and Usha M Rodrigues (2010): Indian Media in a Globalized World, New Delhi: Sage Publications.

Ranganathan, Maya (2010): 'The Naga Nation on the Net' in Ranganathan and Rodrigues.

Ranganathan, Maya (2010): 'Freedom in the Indian Blogosphere' in Ranaganathan and Rodrigues.

Siddhantha, Priyadarshini (2010): 'Clearance Hurdles Blocking Broadband Penetration, warns DoT', Indian Express, October 25, p. 15.

Sreekumar T.T.: 'Cyber Kiosks and Dilemmas of Social Inclusion in Rural india', Media, Culture and Society, Vol. 29, No. 6, 2007. pp.869-889.

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Alwyn Didar Singh

The Evolution of E-Commerce in India

A Policy Perspective

Editor's Note

This chapter explains how India cashed in on the technology boom opportunity in the United States much more than any of its counterparts, creating an 8 billion USD computer software industry from scratch in the last decade. Gains via e-commerce for domestic and international markets come from the appropriate legal and financial framework, and the political and business environment. India is expected to log the highest compounded annual growth rate (CAGR) of over 80 percent amongst the Asia-Pacific countries in e-commerce revenues. Also it is seen that India has graduated from basic EDI to rapid growth in e-Commerce and m-Commerce. An estimated 40% of e-commerce is accounted for by the travel sector. Indian Railways ticketing alone is said to account for a quarter of India's e-Commerce industry. In future, there needs to be more consumer confidence in using credit cards online, and better customer service by e-commerce vendors

No country rode the technology boom in the United States more spectacularly than India, which created an $8 billion computer software industry from scratch in the last decade. Now, as the slowdown in the United States rolls like a wave through one Asian country after an other, executives in India are putting up a brave front. They insist that India will be the breakwater: the one export-driven country in the region that holds off the tide from across the Pacific.

(Opportunity Knocks: India's High-Tech Bull Is Ready for Bear, Mark Landler, New York Times Service, March 14, 2001)

This quote from 2001 could very well be from 2009! In many ways the 2001 'dot-com' crash resembled the financial crisis of 2007-08. For the Indian IT sector, by the end of 2002, it was quite clear that India not only had been the proverbial breakwater that held off the tide[1] but in fact rode the waves of success by registering continued Information Technology (IT) and software export growth, by over 30% in 2000 through 2002. By the end of 2002, it also added another additional massive growth of Business Process Outsourcing (BPO) or IT-enabled services that recorded another 2.5 billion USD by 2003, taking the total IT Services and Software Exports to 7.1 billion USD.[2]

Similar has been the case after the global economic crisis of 2007-08, where most Western economies are still to fully recover, but in India not only is GDP growth some 8% plus, but the IT sector has again shown sound growth. During the year 2008-09, India's domestic computer software / services market was estimated to be 57230 crore INR (12444 million USD), registering a growth of 21.74 percent (6.57 percent in USD terms) over the year 2007-08, and Export of Computer Software / Services (including ITeS / BPO) registered a growth of 30 percent (14 percent in USD terms) during the year 2008-09 over the year 2007-08. Exports grew to 49.6 billion USD up from 43.5 billion USD in 2007-08. At a total of some 62 billion US dollars, eCommerce has grown 15 times from just 4 billion US in 1997 – just 12 years ago! Quite clearly eCommerce in India has been a resounding success. This chapter highlights the policy and strategy behind this phenomenon and records some of the principal lessons relevant for developing countries.

This is the success of a developing country that surprised – even stunned - the whole world with its achievement in the digital economy by serving as a beacon on the horizon of the new digital age. Its accomplishment is no more a one-off or marginal, in growth, or sustainability. How did India do it and what lessons are there in the Indian example for other developing countries? What policy initiatives and strategic moves did India make? This chapter attempts to provide some answers to these and related questions. It tracks and traces the Indian success story from the perspective of policy research, analysing the key strategies that have been responsible for the achievement. Details of the strategy across the key issues and factors are outlined especially with regard to the legal framework (Information Technology Act); the telecom policy; industry level initiatives and the technical manpower that provided the human capital for success.

Understanding E-commerce

E-commerce, as we understand it today, has been made possible by the Internet and the 'World Wide Web'. The Internet is a global computer communications network, while the world wide web is a tool that makes the Internet easier to use, and more powerful for users. While the Internet and the web have together revolutionised communications and information-sharing, they have been built firmly on prior developments in information technology and communications networks. Basically, the Internet is a vast and ever increasing network of computers across the globe. It is a, or the, network of networks. In brief, the Internet is the entire network of thousands of individual networks, all of which can interact with each other and are interconnected.

The economic rationale of the Internet comes from e-commerce. The Internet has multiple functions, being essentially a means for improved communication and for accessing and exchanging information worldwide. One of these functions has to do with economic and financial transactions and trade, grouped under the generic name of 'electronic commerce' or e-commerce.

The Organisation for Economic Cooperation and development in 1997[3], defined eCommerce as "all forms of transactions relating to commercial activities, including both organisations and individuals that are based upon the processing and transmission of digitised data, including text, sound and visual images". Simply defined, e-commerce is conducting business on-line. E-commerce has also been described by the OECD as a new way of conducting business, qualifying it as business occurring over networks that use non-proprietary protocols established through an open standard setting process such as the Internet. This definition distinguishes it from the earlier EDI type proprietary networks or Intranets that were not based on an open (and therefore not cost effective) information infrastructure like the Internet.

The terms e-trade, e-business and e-commerce are in fact interchangeable, as they are essentially all derivatives of electronic commerce over the Internet. Both as a means of enabling B2G/G2B transactions, as well as for utilising the potential and power of e-commerce and the Internet for development, policy regarding e-commerce must necessarily include the usage of Information Technology (IT) within government itself, as also for offering better services for citizens. Electronic commerce therefore also includes e-government, especially in its use as a tool for development. Government's usage of this technology through e-government is, but an extension of the potential and practice of e-commerce by the government. The argument here is that in promoting business on-line, governments will facilitate the delivery of information, goods and services. This will, on the one hand, deliver more volumes across data-networks which, in turn, will serve to provide the revenues and investment rationale needed to encourage further infrastructure development. On the other hand, this will also provide transactional opportunities for the private sector and thereby develop e-commerce further.

Electronic commerce is dependent on several key preconditions. For developing countries these include widespread availability of the Internet for which access to modern telecommunication systems is therefore perhaps the determining element. A well functioning, modern telecommunication infrastructure and a satisfactory distribution of electricity, along with access to computer hardware, software and servers are the basic technical requirements for electronic transactions. This essentially entails the telecom infrastructure—the information highway on which e-commerce rests and develops. Since the main issues here are access and the cost of connectivity, the level of PC[4] penetration, total number of Internet accounts and the pricing of connection plans of the existing ISPs[5] determine the infrastructure, as do initiatives for any incubator type facilities in the country.

However, for actualising the potential of e-commerce in the 'new digital economy', it is not just the hardware and physical infrastructure that is enough. What is required is an 'info-structure' meaning the framework and environment for e-commerce that includes the appropriate legal and financial framework, the political and business environment (network service providers and enabling services[6]) conducive to its development and the capacity or human resource to deal in it. It is essential to create a policy and regulatory environment that favours the development of e-commerce and harmonises national approaches in diverse areas, including telecommunications, trade, competition, intellectual property, privacy and security.

Growth of e-Commerce in India

Traditionally August, 1995 is considered as the birth or introduction of the Internet to India, when VSNL introduced the Internet via dialup in six cities. E-Commerce of course rode on the Internet or digital revolution and today is very much part and parcel of it. However, it merged with the Internet through a somewhat different route.

The use of E-commerce started around two decades ago with the invention of technology such as Electronic Fund transfer (EFT). Initially, its use was confined to big corporations, financial institutions and a few business entrepreneurs. With the introduction of Electronic Data Interchange (EDI), its use extended to producers, retail traders and other services. In India too, it was initially EDI where the power of digital transactions was realised and which later evolved into 'e-Commerce' with its usage spreading in many different areas such as stock trading, travel reservations, B2B transactions and the like.

India is a developing country that entered the Information Technology revolution several years ago. From low-end data entry type operations to Y2K solution providers,[7] the expertise and business had by 2009 converted itself into a USD 49 billion plus industry, with another 12 billion US plus of domestic business. Software exports grew at 55 % for some 10 years (from 1990 to 2000), and even with the dotcom crash and slow down in the world economy (from 2000) have continued since then to average between 15 to 20 %.[8] India has steadily emerged as a leader in the field of software engineering, web-based services and e-commerce. India's competitive advantage in this business has been cost-effectiveness, world-class quality, high reliability, and rapid delivery; all of it powered by state-of-the-art technologies.

What should we understand by e-commerce in the Indian context? India's success in the digital world is mainly on account of its software exports and its software professionals (who themselves are often part of the service export). Since 2002 there has been a distinct shift in the Indian IT world—both external and internal—from software towards electronic commerce. For the purpose of this chapter therefore, e-commerce and its definition for India encompasses three areas.

(i) Software exports: body shopping to e-commerce services;
(ii) IT or Web-enabled services (ITeS): transcription services to call centres—BPO;[9]
(iii) E-business and e-trade: dot-coms,[10] portals, services and old and new economy glob supply chains.

In the first, can be seen a pronounced shift from the earlier mainly low-end software solutions to definitive sectoral software projects for businesses, as well as e-commerce software and services for mostly the external sector.

The second, i.e., IT or web-enabled services (now referred to as ITeS and 'BPO' or business process outsourcing) are really a result of the proliferation of the Internet globally on one hand, and on the other hand, the 'death of distance' for industry and services in the West that is leading companies to locate their call-centres and other 'back-office' services in far flung locations. Such services include medical and legal services, insurance claim processing, call-centres, web-services and a whole host of emerging opportunities in the area of digitizable business processes.

The third is the hard-core e-business and e-trade services and projects. These include new (Business to Customers) B2C and (Business to Business) B2B websites and portals as well as the e-business that Indian domestic companies have started. On the e-trade side, there are the initiatives where Indian trade and industry is doing transactions for export and import as well as the digital processes introduced in Indian regulatory bodies to facilitate such trade and commerce.

Competitive Advantage

As a symbol of globalisation and in many ways its leading feature, e-commerce also represents one of its distinguishing characteristics, i.e., where the extension of the international division of labour goes beyond international trade to geographic enclaves in different stages of the production chain.[11] The development of the software industry in India, and especially its initial concentration in Bangalore, represents this very unique feature of the new digital economy. It illustrates the impact of global value adding networks and supply chains as well as local development and growth—now replicated at multiple levels of innovation including state led initiatives as seen in Hyderabad, Chennai, Delhi, Pune and so many other parts of the country.

Despite the high growth rates witnessed over the years in IT and software growth, India's share in the world software product market is still very low. However, India still enjoys an advantage over many other nations in software development, services and exports. This is partially due to the fact that India possesses the world's second largest pool of scientific manpower, which is also English speaking. Coupled with the fact that the quality of Indian software is considered good at relatively low cost, it makes for a definitive competitive advantage in the global software economy.

It has been estimated that by mid-decade anywhere between one-half and two-thirds of all Fortune 500 companies were outsourcing their digitizable technical requirements to India.[12] A mature market with hugely improved telecommunications, fluency in English and a high-quality engineering skill pool; it is no surprise that India was reportedly exporting software to over 95 countries. Also, it is not just a matter of cost; it is about value addition at a competitive rate.

Compared to typical US loaded costs, India based software development delivers a huge advantage. This is expected to remain 3:1 for a long time. For web-enabled services like medical transcription and call centres where just English speaking graduates are required (as opposed to engineering graduates for software), the cost differential is nearer 5:1. Besides cost, more and more US and European companies are looking at talent lock-in as a competitive issue as availability in the long-term basis will be in question. Even in situations like the US economy slow-down, out-sourcing makes sense in a strategy of cost-cutting to address the increased competitiveness. Some experts have calculated that a typical western bank for example, can outsource 17% to 24% of its cost base, reducing its cost-to-income ratio by 6-9 percentage points, and in many cases doubling its profits.[13] Since manpower accounts for some 80% of the production cost in the software sector, overall development of software in India is 40% to 50% cheaper than the US or Europe/Japan.

For IT enabled services, the competitive advantage is even higher. The National Association of Software & Services Companies (NASSCOM),[14] in a comparison across the Asia Pacific region of several factors such as workforce, market access, infrastructure and cost, has outlined that on average the best location by far is India.

A distinct shift has taken place in India today. This has been the industry response to the digital economy. From the low end, back end software jobs that were mostly IBM mainframe software projects and body-shopping services provided to US companies, the three major areas of IT services export that have emerged are e-commerce software and services; web-enabled services; and e-business and e-trade transactions and services.

From the almost complete concentration on software, Indian exports are evolving into these three distinct growth areas. The growth is shown in Table 1.

According to a recent report published by the prestigious Internet research firm IDC[15], India is expected to log the highest compounded annual growth rate (CAGR) of over 80% among Asia-Pacific countries in e-commerce revenues between 2004-09, even exceeding the growth rate displayed by neighbouring China in the five-year period.

Government Initiatives: An E-Policy

Table 1: Growth of e-Commerce in India

Year	External Sector		Internal Sector
	Total IT Services and Software Export (USD)	e-Commerce related software and business (USD)	e-Business
1999-2000 2000-2001 2002-2003 2005-2006 2008-2009	3.4 bn 5.3 bn 7.1 bn 20 bn 50 bn software including 20 bn web-enabled Services	0.5 bn 1.4 bn 2.5 bn 4 bn 10 bn	INR 450cr (USD 100m) INR 15000cr (USD 330m) INR 25000cr (USD 500m) USD 12 bn

Source: NASSCOM and recent projections by IDC

In the national agenda, information technology is an area that has been accorded special importance with the objective of making India a software superpower in the new economy. To translate this e-vision, several initiatives were taken both by the policy makers and by industry. With a proactive role of the private sector, and the active support of the Government, India has emerged to be one of the most successful destinations in the area of information and communications technologies. To bring benefits of the IT revolution to the masses, to improve productivity of the enterprises and to enhance competitiveness of the Indian industry, the government in 1999 formally defined its vision: 'To make India a global Information Technology superpower and to strive to make Indian software industry one of the largest exporters of software in the world by 2008'.[16]

To realise this vision, the Government of India initiated several plans and programmes to create a knowledge-based economy. Key features of the policy initiatives and the management of them in the Indian example are described below.

EDI to E-commerce

As part of its liberalisation and trade policy reform process begun in the early 90s, the Indian government took upon itself to actively introduce EDI (Electronic data interchange) as a trade support and facilitation measure. It soon became apparent, however, that the introduction of EDI was more of a management issue than a technology one. Government departments dealing with trade and the infrastructure for trade and computer network facilitation would have to undergo process re-engineering of their procedures and themselves. Though this proved to be a daunting and rather slow task, the commitment and pursuit of it at various levels in government and industry, led to the creation a favourable environment for eventual e-commerce framework improvement.

Government took several steps for implementation of EDI, which included setting up of a high-level EDI/E-Commerce Council, liaison with UN bodies, separate working groups for legal, technology, banking and HRD issues, etc. In order to meet the new needs of the business community, two of India's major organisations viz: National Informatics Centre (NIC) and Videsh Sanchar Nigam Limited (VSNL) established EDI VAN services. Key areas where immediate attention was required were identified such as user awareness, human resource development and message development in line with UN/EDIFACT. An HRD group was also formed to look into the needs of human resource development, training and other related needs of the EDI sector. These EDI initiatives from 2000 onwards converted to e-commerce and e-governance initiatives.

Other Key Initiatives

The government also took up key initiatives over the past few years to create an environment that is conducive to e-commerce activity. These include the following:

(i) Setting up of and implementing recommendations of the National IT Task force. This high level body, which brought together industry, scientists and bureaucrats provided both the strategy formulation as well as the detailed action plans on whose implementation lay the continued growth of this sector.

(ii) In early 90s, when India was first seen as a potential centre for software development and outsourcing, two main hurdles were identified in this path:
(a) cumbersome government policies and procedures;
(b) poor communication infrastructure.

Hence, a need was felt to form a premier agency, which would fight these hurdles as part of its mandate and aim at making India an IT powerhouse. The Software Technology Parks of India (STPI) came into existence in 1991 as an autonomous organisation under the Ministry of Communication and Information Technology. The STPI scheme set up by the then Electronics Ministry[17] of the Government of India essentially provided two ingredients:
(a) adedicated 24-hour satellite-based data communication link for software exports &
(b) a supportive export facilitation environment.

This scheme proved to be one of the key catalysts for success, as STPI parks came up in the main export and business oriented locations (five to start with and now over 17) where supporting incubator services evolved. This intermediate and focused approach that concentrated on a few chosen locations rather than awaiting Internet connectivity across the country, provided the required infrastructure for a very successful software export strategy.

(iii) Announcement of the ISP[18] policy for the entry of private Internet service providers in November 1998 thereby opening up of the Internet Service Providers sector to the private sector. This was backed up with according permission to private ISPs to set up international gateways. This included giving complete non-monopolisation of undersea fibre connectivity for ISPs on August 15, 2000. Permission of Internet access through cable TV infrastructure was also given.

(iv) Introducing competition in the whole Telecom sector, including mobile phone services

(v) Government fully backing rapid growth by committing tax concessions and infra-structure for software and IT.

(vi) Initiation of the setting up of the National Internet Backbone, subsequently followed by the Broadband initiative. This included giving free right of way facility, with no charge in cash or kind, to access providers to lay optical fibre networks along national highways, state highways and other roads.

(vii) Venture Capital and a favourable stock market added the necessary support.

(viii)Hundred percent FDI (foreign direct investment) was allowed in B2B e-commerce.

(ix) A legal framework for e-commerce was provided by passing of the Information Technology Act 2000 (and an Amendment Act in 2008) making India- the 12 country worldwide to have such a comprehensive legislation for e-commerce in place. This Act also had consequential amendments in the Indian Penal Code 1860, the Indian Evidence Act 1872 and the RBI Act 1934 to bring them in line with the requirements of digital transactions.[19]

Industry Initiatives for E-commerce

Starting with the setting up of the first software R&D centre by Texas Instruments at Bangalore in the early 80s, the software industry grew by leaps and bounds. Interestingly the vital private sector actions that facilitated the growth of Bangalore as an IT success-story came from foreign players. Texas Instruments and Motorola are often cited as pioneers in this area. Initially seeking low-end coding work to be handled out of their low-cost Indian bases, more and more multinational companies set up development centres with an ever-growing mandate in terms of the quality of work required. In addition to the multinationals, Indian firms have also made a significant contribution to develop the software industry. The most successful firms and their business leaders (Narayanmurthy of Infosys and Premji of Wipro for example) have emerged as national heroes. Many of them have gained from international networks—primarily involving Indian software professionals and entrepreneurs based in Silicon Valley, California. In fact, reports indicate that one in every three Silicon Valley start-up was founded or co-founded by an Indian.

Scores of IT entrepreneurs set up software export services that over the years have captured both market opportunities as well as the attention of businesses and media across the globe. What has been the key component to this success is that these software export companies constantly upgraded their skills and sought to provide whatever services US and Europe business required. In that sense, the Y2K problem in the late nineties provided a unique opportunity for these Indian companies not only to generate large scale business, but to establish credibility and contacts that later converted to e-commerce opportunities. Supported by a strong business association lobby (through bodies like NASSCOM, ESC[20] and CII[21]), this industry demanded and received support of government and its agencies from land allotment, electricity connections and satellite links to special tax incentives, fast-track clearances and supportive government policies. Such bodies played a strong role both in terms of lobbying with the government and representing the Indian software industry abroad in forums such as trade fairs.

The IT industry success and tremendous contribution not just to exports but also to employment and the local economy have resulted in IT, software and e-commerce becoming the favoured strategy of politicians across the country. From the famous 'laptop' Chief Minister of Andhra Pradesh (Chandrababu Naidu) to just about every state industry and chief minister, a totally politically supportive environment for IT exists in India today.

In order to ensure a public-private partnership to achieve the goals of IT and e-commerce in India the following are some of the strategic initiatives that were taken up jointly by government and the industry:

(i) To continuously upgrade the productivity of the Indian software industry by de-licensing and de-regulating the import of software productivity tools.
(ii) Companies and software development organisations were encouraged to spend at least one-fourth of their total software budget for the purchase of software productivity and quality tools.
(iii) The high quality of Indian software services and software products exported, to be sustained by compulsory insistence of ISO-9000/SEI level-5 Standards or equivalent.
(iv) To increase international credibility, software companies to be allowed to utilise a part of their export earnings for putting in place all necessary means for meeting strict delivery schedules and customer satisfaction.
(v) To create confidence among the recipient organisations in developed countries, the existingcopyright law, to be implemented in practice by suitably enforcing the existing laws.
(vi) To enable tapping of the vast global market in products and packages (the next step of

the value chain) the following key strategies were taken up, to encourage trend-setting Indian companies and to pave the way for new entrants:

(a) encouraging infrastructure industries like petroleum, power, steel, banking, in surance, hospitals and mining to work with the various Indian product soft ware companies and to create global reference sites;

(b) banks were asked to extend working capital limits for product software com panies;

(c) The government announced a scheme to provide soft loans/subsidies for brand building of product software developed in India through the India Brand Eq uity Fund of the Ministry of Commerce.

(vii) A reorientation programme was taken up through CII and NASSCOM with promotional government funding in the following areas among others: euro solutions, IT-enabled services, net-based products, web technologies, electronic governance, electronic com merce and management of convergence.

(viii) A venture capital fund with an initial funding of about USD 100 million for funding start-ups and entrepreneurial efforts catering to IT-enabled services market was set up.

(ix) An industry consortium (under NASSCOM) was formed with the active collaboration of the Government of India, NRIs[22], leading Indian industrial houses, software companies and venture capitalists to address the huge opportunity offered by IT-enabled services.

Providing the Human Resources

The world famous Indian Institutes of Technology (IITs)—just six of them—were the rocks on which India's software strength was initially built. Both in Indian software companies as well as in software jobs in the US, these and other Indian engineers coming from the scores of other engineering colleges, these brains have not only provided the software solutions but also the software ideas that resulted in some 30 % of all new software companies in California's silicon valley being set up by Indian 'expats' and hundreds of Indian software companies obtaining collaborations and business. Today countries across the globe (US, UK, Germany, France, Italy and Japan) offer special visas for attracting Indian software engineers. To cater to this international as well as domestic demand, several steps have been taken by government to increase the output of skilled professionals to meet the growing demand. Even though education has traditionally been a state responsibility, hundreds of private software, IT enabled services and e-commerce training institutes have mushroomed all across the country—and not just in the big metros. In fact training and education itself emerged as a new e-commerce export activity with some of the big players[23] in this computer education field setting up branches abroad and portals on the Internet.

According to the Task Force on HRD for IT set up by Government of India in 2000 there were 1270 colleges (776 colleges awarding degrees in engineering and technology and 494 colleges awarding MCA as on 4 May 2000) in the country with a total intake of 2,05,153 (1999-2000). It has been estimated that by 2003 there were over 3000 engineering colleges and institutions (excluding the IITs) in India from 1021 shown to have been there in 1998. From all these together, the total number of engineers graduating were over 2,50,000, a figure that crossed 3,50,000 by 2007.[24] Large numbers of graduates from other disciplines also migrated to IT. This is perhaps in response to significant new opportunities in these areas and also to the fact that the software industry is now looking for professionals with domain knowledge in other fields of engineering.

The moot point here is that quite consciously and with a specific strategy, government and industry together planned and put in place the HR requirements through several joint strategies.

Key Factors of Success

Physical features and technological advances are not necessarily the only ingredients of success. The most developed and expensive technology may not necessarily be the key as business acumen and entrepreneurship functioning in a conducive policy environment is more important. Similarly, weak or inadequate infrastructure is not necessarily an impediment, just as developed infrastructure is not necessarily a sufficient condition for success[25]. Some of these policy and environmental factors are outlined here.

Intermediate Development Strategy Model

Telecommunication is the backbone of e-commerce and the Internet. The technology is available but the costs are very high—especially for a large country like India. Realising this and following an intermediate development strategy has been one of the key reasons for India's success in software. Rather than attempting to provide Internet and satellite links across the country, India followed the strategy of providing Internet access initially to only important commercial centres, especially where there was a concentration of export-intensive industry. Satellite earth stations were set up by VSNL[26] and STPI[27] at key locations (just 8 to start with) for providing 24 hour guaranteed on-line connectivity to software companies for export activities, much before Internet was available on the existing telecom channels. This was the digital frame on which the software revolution was built.

It is interesting to note that this policy prescription matched the technical requirements of the industry and in a sense explains its concentration on software and now IT-enabled services. Software exports and IT-enabled services like medical transcription and call centres, which were and are directly to specific partners or clients in the US or Europe, need just basic connectivity (not even the Internet). This was provided through the VSNL and STPI satellite links. Therefore, bandwidth, a legal e-commerce framework and a payment gateway were not major issues in the last few years. Similarly, legal framework and payment gateways were not needed as the transactions were via traditional methods between specific partners. Today for e-commerce market places, digital products like music or videos, etc., or large automated supply chains, all these are essential requirements. This explains why the latter services were somewhat slow to mature and mushroom.

Inherent and Acquired Factors

Of course there were also several other factors such the availability of highly skilled (IT) and English-speaking manpower in India coupled with a shortage of such manpower in the West (especially in the US); a robust IT market at home, availability of venture capital and other funding and a largely supportive government. India also gained because of the first-mover (amongst developing countries) advantage and quickly gained a reputation for quality at reasonable cost, and quantity that seemed unlimited. Links with the Indian diasporas, especially in the US were also well utilised.

Environmental Factors

In analysing the environment that led to the success, it could also be argued that there were other additional factors that played a role in creating the right 'environment' for success. Some of these cultural, social and environmental reasons could be said to be the following:

The Liberal Tradition Factor: Democracy and traditions of market oriented philosophy have been part and parcel of the Indian business environment ever since independence over half a century ago. Despite policies akin to welfare and socialism, a very strong private business environment and liberal tradition developed in the country. From 1991 the introduction of the structural adjustment programme resulted in the promotion of policies of liberalisation and trade reforms furthering the market oriented economy and export sector.

The Spill-over Factor: In the 60s and 70s the 'spill-over factor' accounted for one of the mostly unknown facts of Indian investment overseas—i.e., that it was then one of the highest levels of investment overseas amongst all of Asian countries. One of the most important reasons were the restrictive economic regulations prevailing in India at that time where industrial investment rules and regulations prevented Indian industry from expanding capacities within the country. Such types of controls is what resulted in the cable TV revolution of the 80s, where people starved for entertainment on TV, controlled and regulated by the state run 'Doordarshan', switched allegiance to the unregulated but booming private cable channels that began to be offered by small operators all over India. Satellite data links and the Internet provided another unique opportunity to cross geographical barriers and state regulations and take on business contacts and ideas that were truly global. It was a revolution waiting to happen, and it has.

The Brain-gain Factor: This is the much condemned 'brain-drain'. This was the phenomenon of the best Indian brains—usually engineers—leaving the country for better jobs in the West. It actually turned out to be a 'brain-gain' in the western and capitalist economies that the brains found themselves. The Indian professionals adapted and succeeded quickly in the new environment. There are several examples of success of Indian expatriates in Silicon Valley and elsewhere. Several of them began returning to set up joint ventures and software and e-commerce businesses in India. Not only did they contribute to the brand image of India but are also continuing to be excellent links for Indian software and overseas business.

The Bridge-investment Factor: For years, experts compared foreign direct investment (FDI) into China with that into India and saw that one of the main reasons for the high investment coming into China was overseas Chinese investing back home (through Hong Kong mostly). The non-resident Indians (NRIs) did not, or were very apprehensive of doing so. They feared that their investment would fail or be subsumed by Indian bureaucracy and regulation. Software and IT business provides a chance to invest in India and yet remain with one foot in the west (either through a joint venture arrangement or through a buy-back mechanism). That foot or bridge is the essential and safe link in the investment and therefore resulted in NRIs investing in the IT sector in India.

The 'English' Factor: Indians are not just English speaking but quickly can adapt to new global business practices and standards. Today, as basically American standards and business practises become the norm, English or 'American' speaking employees can be a tremendous asset. This accounts for the success of call centres and web-enabled services located in India catering to the US market and manned by employees speaking English with an American accent.

The Partnership Factor: Government and private sector collaboration in the field of IT and software export promotion represents a unique and momentous export success story. Such collaboration is unprecedented in most bureaucratic and business dealings in most of the developing world. Software exports occur mostly digitally and exports in India are not subject to customs duty and export earnings have mostly been exempt from income tax. This provided an environment where there was the least contact of businesses in this area with the lower echelons of officialdom. Coupled with a supportive policy regime the result was much higher levels of efficiency in delivery and production for the sector.

The Cluster Effect

After Silicon Valley in California, probably the most famous ICT cluster is, Bangalore in Karnataka state in India. Most of the factors identified in the literature on clusters have contributed to the existence of the software cluster in Bangalore. The education institutions in Bangalore provided a rich source of supply of engineers and technicians, but the industry is not solely dependent on local talent. It draws its labour force from all over the country—and in fact from all over the globe now. Each of these factors is of particular significance to the ICT sector in general and Bangalore in particular. However, there was something more. This success is effectively based on what can be referred to as 'collective efficiency'—the competitive advantage derived from the combination of local external economies and joint action.[28] Joint action is the active ingredient of collective efficiency and refers to joint efforts of improving effectiveness and competitiveness within the cluster. his success of Bangalore has been replicated at other locations such as Chennai, Pune, Mumbai and Delhi and the key factor has been public private partnership.

Some Barriers to E-Commerce in India

Though undoubtedly e-commerce has shown unparallel growth, especially in the overseas export area having grown to some USD 50 billion, the domestic growth has been somewhat below its potential. During the year 2008-09, India's domestic computer software / services market was estimated to be INR 57230 crore (US$ 12444 million) registering a growth of 21.74 % (6.57 % in US$ terms) over the year 2007-08.

In India, though the promise and capabilities of the ICT technologies (e-commerce, B2B, B2C, e-trade, e-business, etc.) are already in evidence it is some way to go before these become commonplace for a number of reasons. There are now B2C e-commerce sites in thousands ranging from general purpose sites (www.rediff.com) to specific sites that will let you order your groceries (www.home-land.com, www.bababazaar.com), buy cinema tickets (www.clicktickets.com), real estate property listing services (www.indiaproperties.com), to sites that enable one to buy anything from computers to an automobile via the Net. It is, however, estimated by recent reports, that 40% is accounted for by the travel sector. In fact, IRCTC (Indian Railways ticketing) is said to contribute one-fourth to India's ecommerce industry – having sold 38.7 million tickets (as of Feb 09). Travel as an ecommerce category is big in India and is the one segment that's growing rapidly – it still means that Indian consumers aren't buying 'other' things online. B2C e-commerce model needs to shift from transaction based (fight for the lowest price) to relationship based (how do I get repeat customers? how do I generate more demand?) And of course the real growth and depth will come once B2B domestic e-Commerce takes off.

There are a few pre-requisites related to the social environment that have to still fully fall in place;

(1) Sanctity of Credit Card Transactions
Most Indians continue to be sceptical in giving out credit card numbers over the web. In India, though they are being used quite extensively, especially in the travel sector.

(2) Not yet Legal
The validity of a card transaction without a physical signature is still in doubt. There is no regulatory ruling that has come out in this regard. The default at this point is that an on-line credit card transaction could still be considered invalid without a signed credit-card slip. Transactions therefore are mostly of low or medium value.

(3) No Client-service Focus
B2B e-commerce needs very high quality customer service (what is referred to as CRM or customer relations management) to really 'hook' consumers and get them to come back repeatedly. Airline bookings are the one area where this confidence is mostly estab-

lished. According to a recent report of market research firm IMRB International, the size of the business-to-consumer (B2C) e-commerce industry is expected to grow by 30 % from 2008 onwards. Over half of such business will be in the online travel: industry-air, rail and hotel reservations, car rentals and tour packages.

(4) Not so Reliable Delivery Infrastructure
In cases where physical delivery of products is concerned, online transactions need to be anchored by highly predictable and reliable delivery mechanisms. The record of accomplishment in this area has been somewhat inconsistent and is still not close to the levels that will garner complete customer confidence.

(5) Cultural Factor
The existing culture does not facilitate the purchase of 'unseen' things. India is often described as a face-to-face (f2f) country.

(6) Poor PC Penetration
With PC penetration at about 0.3 computers per 1000 people (in 2007) and Internet penetration that is still low, where are the shoppers going to come from? Internet users, of course, are growing from 2.5 million in 2000 to some 50 million plus by 2008. The question is whether this converts to online shoppers.

Do we see interesting new business models/opportunities rising out of these constraints? Yes, and that is what will spark the e-Commerce economy in the future.

Conclusion: Perception of Government's Policy Prescription

So far as Government in India is concerned, the policy and strategy of e-commerce has evolved from one time regulator to that of facilitator. It did so by passing through four phases.

(i) The introduction of IT within government and setting up of bodies such as NIC and ERNET. This was the 70s and 80s phase.
(ii) The review and policy setting phase in the early 90s where the IT Task Force was set up and its recommendations sought to be implemented.
(iii) The mid 90s onwards facilitating environment phase with the establishment of the STPI and earth stations for software promotion.
(iv) The 2000 onwards phase where e-commerce is assisted and e-governance actively prompted.

There are some who would argue that the Indian government's greatest contribution to the IT and software industry lies in its benign neglect of it for many years. Some leading IT executives in the last decade felt (some continue to) that the government should focus its efforts only to promoting the expansion of technical education, deregulating the state-dominated telecom network, and facilitating the broad bandwidth infrastructure that the IT-enabled businesses need, and leave the rest to private industry. Since 2004 onwards, research reveals that impressions regarding government's role were turning grudgingly favourable and today the private–public partnership together addresses issues both domestically and globally. Just like e-Commerce in India over the last 15 years, the relationship too has truly evolved.

References

[1] Of the then on-going 'dot.com crash' of 2000-2001 that saw the collapse of tech firms in the Nasdaq exchange in the US.

[2] Source: NASSCOM and ESC.

[3] Organisation for Economic Co-operation and Development, Measuring Electronic Commerce, Committee for Information, Computer and Communications Policy, OECD, Paris, 1997.

[4] Personal computer.

[5] Internet service providers.

[6] OECD, The Economic and Social Impact of Electronic Commerce, 1999, has listed these as including inter alia: E-payment, authentication/certification services, advertising, delivery, etc.

[7] The year 2000 date fixing problem that provided great opportunity to our so called 200,000 English-speaking pairs of hands a year!

[8] In the 90s India's fame in the digital world grew mainly on account of its software exports registering growth rates of over 50 percent. This slowed down over 2000-2002 and then picked up again to a steady 25-30% growth till again reducing with the financial crisis of 2007-08.

[9] Business Process Outsourcing.

[10] Internet start-up companies as they were referred to in the late 90s, now being called Net 2.0 companies.

[11] A Lateef, 'Linking up with the global economy: A case study of the Bangalore software industry', Geneva: International Institute for Labour Studies, ILO, 1997..

[12] 'The Indian Talent Scenario: At a premium', at Peoples News Online, 21 July 2004, at http://www.hewittasia.com/hewitt/ap/e-news/pno3/july2004/print/TalentScenario.html? a=978065&b=8593&c=8553

[13] The Economist: 'India—back office to the world', at www.ebusinessforum.com.

[14] NASSCOM Directory 2001, IT Enabled Service Providers, NASSCOM, New Delhi.

[15] Business Line, 4 August 2004, India to log the highest e-com revenues among Asia-Pacific countries, IDC report as quoted in Business Line, India at www.id4online.net. IDC is one of the premier global market intelligence and advisory firms in the information technology and telecommunications industries.

[16] Pronouncement by the Prime Minister of India on IT policy, 1999.

[17] Now called the Department of Information Technology in the Ministry of IT and Communications.

[18] Internet Service Providers.

[19] Similar amendments are being planned for the Companies Act 1956 to also facilitate e-commerce and e-governance.

[20] Electronics and Software Export Promotion Council, India.

[21] Confederation of Indian Industry.

[22] Non-Resident Indians

[23] NIIT one of the oldest of these computer education companies today has centres in 31 countries abroad besides some 1400 in India.

[24] 'IT Manpower Challenge and Response', Interim Report of the 'Task Force on Human Resource Development (HRD) in Information Technology (IT)' set up by the Ministry of HRD, 2004.

[25] A Didar Singh, Electronic Commerce: Issues for the South, Geneva, South Centre, 1999.

[26] Videsh Sanchar Nigam Ltd, the international telecom arm of the DoT.

[27] Software Technology Parks of India, a body under the then Electronics Department.

[28] The Information Technology Act 2000 has been passed and bandwidth expansion is now occurring.

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Part IV

Case Studies

Chapter 21

Arjun Kalyanpur

Telemedicine and the Internet

Editor's Note

The USP of Teleradiology Solutions lies in creating a hub of excellence from where one can provide the report of a scan performed anywhere in the world, such as in the US, within 30 minutes, and in some cases as low as 15 minutes, as in cases with acute stroke. TRS leverages Internet-driven technologies to optimise the efficiency and reporting accuracy of its radiologists, wherever they may be, namely Delhi, Hyderabad, Mumbai, Phoenix, Boca Raton or Jerusalem. They have created an environment of quality, which allows the highest level of diagnostic accuracy to be delivered to a patient, wherever they may be, whether in Indiana or in Itanagar.

The medical speciality of radiology deals with the performance and interpretation of diagnostic medical scans, namely X-rays, ultrasounds, CT, MRI scans, mammograms and PET scans. As medical science has advanced, imaging technologies have evolved rapidly – scanners have become significantly faster and achieve much higher resolution. Simultaneously, many more applications for imaging have become validated by research, for example, twenty years ago a patient coming to the hospital with pain in the right lower abdomen would typically go straight to surgery to have their appendix removed. Today, a CT scan would typically be first requested to confirm the diagnosis (this has resulted in a 20 per cent decrease in the number of normal appendixes being needlessly removed in Western populations). This has also resulted in a major increase in utilisation of radiology in the emergency setting, impacting most significantly on the night shift. The number of scans being performed has also increased due to the rise in prevalence of the big three killers – heart disease, stroke and cancer.

The practice of radiology in India is advancing in leaps and bounds in keeping with these trends (although mostly in urban areas). With the proliferation in private hospitals, and the entry of investors who see healthcare as the next big thing, even the most expensive imaging technologies are finding ready buyers. Institutions such as the government and the military are also making huge investments in radiology. As a result, the latest imaging technologies are being introduced in India almost simultaneously with the West, a dramatic change from the situation in the 1980s, when I was training at the All India Institute of Medical Sciences (AIIMS), New Delhi, at which time the imaging technology gap between the East and the West was in the range of a decade. During my post graduation, the radiology department at AIIMS did not have an MRI scanner, although the technology had been available for over a decade in the West.

In rural India, the situation is dismal. In many situations, a patient has to travel hundreds of kilometres, simply to get a diagnosis. And without an accurate diagnosis there can be no effective therapy. While in many smaller towns and district level hospitals, there is imaging equipment in the form of ultrasound and CT scanners, there is frequently no radiologist to interpret these scans, given that most radiologists are congregated in the metros. This skewed distribution of radiologists results in delayed diagnosis for literally, millions.

To further worsen the situation, radiology training programmes have not grown in proportion to the increasing demands for radiologists, and of late a shortage of radiologists has become frighteningly apparent. In studies performed in the US at the turn of the millennium, this shortage was estimated to be as high as 20 per cent. And the US has about 25,000 radiologists for a population of 200 million. Contrast this with the situation in India where we have only 10,000 radiologists for our population of a billion and it becomes evident what a crisis faces us in the impending future.

Although most radiology departments in the West are today digital and filmless (and more efficient to run, as a corollary), the practice of radiology in India is largely a film-based practice, divided between hospital-based radiology departments and outpatient imaging centres. Both have traditionally functioned in a relatively inefficient manner. A radiologist is required to be physically present at each hospital and at each imaging centre in order for reporting to be carried out. (While in actual fact a radiologist's physical presence is necessary for performing procedures such as biopsies, the process of reporting of radiology scans in the digital age does not require the radiologist to be in the hospital for reporting of the scans, as the images can be electronically transmitted to the exact location of the radiologist over a broadband network). X-rays and scans even when digitally acquired, are still printed on expensive hardcopy film based on the preference of both patients (who are not satisfied with a CD) and physicians who are still used to putting a film on a viewbox.

Although teleradiology was reportedly first pioneered in Boston in the 1960s, it was only in the 1990s when it really took off in the US. This was a result of three trends: the rapid deployment of broadband telecommunications; the establishment of the DICOM standard, which allows all medical imaging; and the development of web-based PACS systems, the technology that enables the digital storage and electronic transmission of medical images. Essentially, this meant that radiology scans performed anywhere in the world could be interpreted from anywhere else in the world where there was broadband connectivity.

Around the turn of the millennium, when we returned to India and set up our company, broadband Internet was still an expensive and scarce luxury. BSNL was the only provider, and the backbone of a commercial broadband Internet was the so-called leased line, a copper wire connection over which broadband was sold in multiples of 128 kbps, and required a great deal of paperwork, with a long waiting period of 3-6 weeks for installation. Reliability was abysmal, with decrepit infrastructure at the local exchanges and dependence on telephone linesmen to address critical outages. And of course, few if any hospitals had any kind of Internet connectivity or IT infrastructure. Those that did typically had a very low bandwidth connection (64 kbps) that was meant for research or as a library resource.

Another challenge was related to the persistence of legacy non-digital radiology systems, which required a digitiser or some type of frame grabber to capture the images. This added another level of complexity to what was already a clunky system to begin with.

In summary, the pre-Internet era of radiology in India, was a time of relative inefficiency where the reporting of diagnostic scans proceeded at a sedate pace dictated more by constraints of infrastructure and process, rather than true attention to the exigencies of patient care. With the relatively slow adoption of IT and ITES by hospitals in India, the situation is to a large extent still crying for change.

At the time when we started TRS (Teleradiology Solutions) in 2002, teleradiology was a totally unheard-of concept in India. In fact, "Terroradiology" was what one linguistically-challenged vendor called it!

Offshoring teleradiology: First steps in India

In the United States, where I was training in the 1990s, teleradiology first began to make an impact towards the end of the millennium when more and more hospitals started to realise its benefits, especially in emergency night support. At Yale New Haven hospital, where I did my residency and fellowship (and then worked in the faculty), I had the opportunity to observe the process first hand. At night, we reported CT scans for the veteran's hospital across town, which were electronically transferred to us. On trips to India, I had seen the burgeoning software/outsourcing industry and realised how the night shift for any US operation could be effectively performed from high tech locations such as Bangalore. It is when reporting scans at 2 am in the Yale emergency room that the idea struck me that the same could just as easily be done for emergency radiology reporting in the era of broadband Internet. While at Yale, I conducted some research into the use of compression to speed up image transmission over the Internet.

I returned to India in the summer of 1999, my wife Dr Sunita Maheshwari, and I having made a trip a year before and decided that Bangalore was to be our new home. We settled down in an apartment in Richmond Town and my wife, a pediatric cardiologist, immediately found a position at a well-known cardiac hospital in the city. As a US board certified radiologist with two fellowships, I thought it would be easy for me to find a good opportunity as well. I was wrong. The hospitals at which I applied showed little or no interest, and in some cases seemed downright suspicious of my motives in leaving the US and returning to India. "Visa problem?" was a common response. Both teaching as well as corporate hospitals showed similar disinterest.

The chairman of the department at Yale University School of Medicine had tried to convince me to stay on and not return to India. I had kept my faculty appointment and since things were not working out in Bangalore, I continued to travel to New Haven, CT and work/teach there for periods of 1-2 months, interspersed with long periods of professional inactivity in Bangalore. During one such visit to Yale, I mentioned during a conversation with the chairman the possibility of my reading scans for Yale for India. He was intrigued and interested, though cautious. We decided to first undertake a feasibility project and see if it would work. Back in Bangalore, I rented an office space and bandwidth at a medical transcription company on Richmond Road and conducted a month long study during which I reported scans in parallel with the radiologist at the hospital in Yale. Interestingly, the results showed commensurate accuracy between my reads and the onsite radiologists. The study was published in the literature and presented at an international meeting in San Francisco. At the end of the presentation, the session moderator asked “How much do you intend to charge for your services?” I knew then that we had arrived.

Another article published with the department at Yale had to do with a clinical project wherein I was reading scans that remained unreported at the end of the workday at Yale. This project went off to a successful start but then fell apart because of internal criticism at Yale against the thought of their outsourcing their scans “to India”. Being still on faculty there I failed to understand what the fuss was about, but when the chairman called to tell me he was ending the project due to the sustained opposition I realised how serious the matter was. The end of the project came as a shock but we girded our loins and having now seen the true potential of what lay ahead, registered TRS as a company in Feb 2002 sinking our life savings into the venture. My wife, the true entrepreneurial co-founder of the venture worked shoulder to shoulder with me at every stage and provided a critical non-radiologic complement to my own radiologic skills, allowing me to focus on the quality of the reporting.

The Journey

The company was launched from our home office, with two computers, two employees and a broadband connection. We also registered with the Software Technology Parks of India (STPI), which helped us greatly in navigating through the unknown waters. A website was launched with the princely investment of Rs 1,000 and immediately started to receive hits. This prompted us to take the next plunge and invest in a robust insurance policy that covered us in the US, something critical for our growth.

The USP of our organisation lies in creating a hub of excellence from where we can report a scan performed anywhere in the world, such as in the US, within 30 minutes, and in some cases as low as 15 minutes, as in cases with acute stroke. Our organisation leverages Internet-driven technologies to optimise the efficiency and reporting accuracy of our radiologists, wherever they may be, namely Delhi, Hyderabad, Mumbai, Phoenix, Las Vegas, Boca Raton and Jerusalem. We have created an environment of quality, which allows the highest level of diagnostic accuracy to be delivered to a patient wherever they may be, whether in Indiana or in Itanagar.

In the early years, work poured in from the US and the organisation grew, with several other radiologists moving back from the US to join our team, and some outstanding locally trained radiologists also joining us. Strategic alliances with growing teleradiology groups based in the US proved beneficial and soon we were able to recruit additional staff and move to a larger rented office. An interesting development came early on in our evolution, in the form of an acquisition offer by a large Indian software company making a foray into healthcare. The offer was simple, join with us or we will crush you. We opted to take our chances, which to this date, is our wisest decision. The offer seemed tempting and risk-free at the time (but in retrospect was paltry and would have put paid to all entrepreneurial aspirations). Regardless, we remained resolute in our belief that the technology could be rented or acquired and that the understanding of the domain was the true determining factor for leadership. Another similar situation arose when one of our US based partners offered to buy us out and were incredulous when we declined (today they are the largest teleradiology provider in the world, having just acquired the second-largest).

Also during this time, a delegation from Singapore visited us to explore outsourcing of their X-rays and were greatly impressed by what they saw, resulting in another delegation visit and yet another until finally in December 2005, we signed an agreement with the National Healthcare group to report for three of their polyclinics. This relationship has grown year on year and today we report for 11 of their clinics and hospitals. In a speech in Parliament in 2006, none other a personality that Lee Kuan Yew, first PM of Singapore mentioned our contribution in glowing terms, an event that greatly excited our partners in Singapore.

In November 2006, we moved to our own campus. Nandan Nilekani cut the ribbon on the occasion and was kind enough to observe in his speech that our growth in our brief life of 4 years far exceeded that of Infosys over the corresponding period of their evolution. Having our own space opened up new opportunities and our impressive infrastructure brought us a host of luminary visitors from the Netherlands, Norway, the US, Singapore and many other parts of the world. Media attention also came with articles in virtually all the international press as well as a supportive editorial in the New England Journal of Medicine.

Over a period of time, our desire to give back to our own community grew. We used the Robin Hood model. Our mission was to use our profits engendered overseas to provide low-cost, high quality diagnostics to our own countrymen who needed it most. And so in 2006, we created the Telerad Foundation, a not-for-profit NGO that leverages our core competence and expertise gained in teleradiology to serve the underserved. Our first success story has been with the Ramakrishna Mission Hospital (RKMH) in Itanagar, Arunachal Pradesh. This hospital had the only CT scanner in the entire state of Arunachal Pradesh, and served a largely tribal population of 1 million people. They did not have a fulltime radiologist, as the only radiologists in the area were too busy performing ultrasound exams. In desperation, the Swami who ran the hospital located us on the Internet and contacted us on e-mail. We responded swiftly and in a short period of time, our IT team was able to establish a link between the hospital and our centre, using remote access tools over the Internet, without anyone having to physically travel to Itanagar. The experiment proved hugely successful and we were soon reporting 15-20 scans a day for RKMH, which prompted the Swami to send us warm letters of thanks, which made all the effort put in more than worthwhile. And even more happily, the PM's office authorised the installation of an MRI scanner at RKMH, which also now sends us MRI scans to report.

We also realised that being fundamentally academic radiologists, our other passion lay in teaching. We remained academic as an organisation, partly motivated by the need to always be on the cutting edge of quality (in order to compete against the "3rd world" perception of us) – however there was also a desire to extend our reach to a wider audience. The Radgurukul training centre was born in March 2008 and inaugurated by Ms. Kiran Mazumdar Shaw, with its state-of-the-art auditorium infrastructure that permits lectures from a speaker anywhere in the world to be delivered in real time to our audience. Also, around the same time, was born the teaching website Radguru.net, which allows us to share our own learning with radiologists across the globe. We realise that while teleradiology may improve reporting efficiencies in the short term the only viable long term strategy to alleviate radiologist shortages is to train radiologists in large numbers. The use of e-learning tools, such as videoconferencing and the teaching website are in sync with our use of the Internet as a means/medium for efficient information dissemination. The International PACS and Teleradiology Symposium that we organise each year is an effort to bring about greater awareness on these subjects to both healthcare providers and industry vendors.

Teleradtech is our newest project/venture. The roots of this technology company lay in our early realisation that although PACS systems abounded in industry, there was no effective RIS-workflow solution for an organisation such as ours, which had radiologists and client hospitals distributed unevenly all across the world. So we had to develop our own. We did this by recruiting a software team and providing them with a detailed description of what we were looking for. The product that emerged gave us our own workflow platform, which served us well and could also be rapidly customised to meet our evolving needs. Eventually the realisation dawned that our product, having been developed 'by and for radiologists' was truly a highly marketable commodity, one that many other evolving teleradiology groups would find greatly beneficial to their operations. The only questions were 'who would iron out its bugs, and who would market it? The answer arrived in the form of a former chip design senior software executive, keen to switch to a more 'happening' sector of industry. In a very short period of time, Ricky Bedi and his team were able to take our homegrown RIS and turn it into a sleek and versatile platform called RadSPA, and several sales have ensued.

Other sectors and segments continue to present themselves as new business opportunities, for example, the process of interpreting scans for clinical pharmacologic trials, the opening up of the reading market in Europe, and research partnerships with blue chip technology companies such as GE and Siemens that provide us with the opportunity to contribute to new imaging technology development.

We are proud to say that we have 3.2 million scans reported in total to date. We are the first and the largest teleradiology company in India, the first Indian healthcare organisation to provide US hospitals with nighthawk services, the first Indian healthcare organisation to be accredited by the Joint Commission and the Ministry of Health, Singapore, and the first healthcare company in India to which Singapore outsourced any of its healthcare requirements. We are rated among the top three teleradiology organisations in the US by the 2010 KLAS survey, which sets the industry standards and benchmarks. We were also selected by the US Consul General as an innovative Indian company to be presented to US President Barack Obama on his 2010 visit to India.

Contributions and Challenges

Primarily, I feel that our organisation has contributed to India's image in the media as a high-end telemedicine-teleradiology hub, providing cutting edge radiology reporting services to US and Singapore hospitals. Secondly, by creating the Telerad Foundation that provides reporting services free of cost to hospitals in remote parts of the country, we have provided access to the highest quality of healthcare to patients in remote locations, hitherto deprived of quality diagnostics. Essentially there can be no treatment without correct diagnosis, and the Telerad Foundation aims to ensure that every patient receives an accurate diagnosis for an imaging study performed. Finally, by creating a training facility that disseminates training in radiology, radiologic technology, and teleradiology to medical graduates, postgraduates and technologists we have provided an infrastructure for increasing manpower capacity within our country in areas of demonstrated shortages.

The first major Internet-related challenge we face is the high cost of broadband Internet in India. The profusion of Internet Service Providers (ISPs) has, in recent years, decreased the pricing, but it still remains high relative to the West. For us to remain competitive to Western organisations, these costs must come down.

Second, low Internet penetration in remote hinterlands, where teleradiology services are most needed, and can make the greatest impact – last mile connectivity is where the challenge is greatest, and in this regard, WiMax and 3G wireless broadband services can act as a game-changer.

A third significant issue is that of unreliable infrastructure and town planning, for example, cutting of underground cables due to unauthorised digging, or construction of a high-rise building that obstructs line of sight from a radiofrequency tower. Frequent power outages resulting in the need for backup generator and UPS, increase the cost of doing business. Improved urban infrastructure, better town planning and reliable power supply will all go towards improving our service delivery greatly.

Internet Growth in India

There are five key developmental stages of Internet growth in India. The first key development in my opinion was the end of the BSNL monopoly, and the entry of competition. This had immediate impact in terms of reducing costs and improving customer service, both of which are critical in an environment where we are directly competing with western-based organisations.

The Lighter Side: Anecdotes and Humour!

A) Reading US scans from India – that's crazy!
This was my wife's initial response when I called her from Chicago to tell her I had potentially found our first client. The deal never actually happened, but we had received sufficient inspiration that were on our way.

B) An interesting incident I recall in the early days was when I was working with Yale and my BSNL Internet line went down. I had to go to the linesman's house and pull him literally out of his house in his lungi with his toothbrush in hand, and drive him to the telephone exchange, where he reluctantly reset my modem!

C) Bangor Maine? Get out of here!!
In the first few months after we started, I had this amusing conversation with an ER physician on the other side of the world. He asked where I was. I braced myself and responded Bangalore. He asked: "Bangor Maine?" whereupon I repeated no Bangalore, India. There was a moment of stunned silence and then he said, " Get out of here!" I have had similar responses many times but none so evocatively phrased as this one.

D) You said no to Tom Friedman?!!
When we had recently set up, Tom Friedman came to India to research his book ' The World is Flat' and develop a TV show around the theme of India Shining. Nandan Nilekani called me to tell me that he had suggested to Tom that he speak with me and I readily agreed. However, one day my phone rang and it was a young and persistent female who informed me that Mr Friedman was on his way to meet me with his TV crew in tow. The anti-outsourcing movement was at its peak in the US media and I could not think for a moment that any good could come to us out of such a TV show. So I called the lady back and politely informed her that I couldn't meet Mr Friedman. A couple of weeks later I ran into Nandan and he asked me in stupefaction: "You said no to Tom Friedman?!" I could only smile in embarrassment back at him. Worse repercussions ensued when the book came out and I realized how big that interview could have been for us. Well, as they say, c'est la vie!

E) Email from client in Georgia
For now all administrative personnel of the hospital have been evacuated and all of us remaining are tending to the injured. Unfortunately there are a lot, and we are getting even more. We are being overwhelmed because we are just a small rural hospital and we are trying to do the best we can.
I'll keep you posted. I just evacuated my wife and children but I will be here for now. The teleradiology project we started is becoming even more necessary now for us. I will keep you posted as much as I can as long as I have some communication channel but even this is wearing thin because a lot of cell towers have been bombed.
May God be with us.
Regards
Konstantin

The second trend was in the form of the replacement of copper with optical fibre cables. I see this as being another major step forward, in that the speed of data transfer was increased and at the same time, the reliability of uptime was increased several fold.

The third trend was related to the availability of low cost consumer broadband Internet availability from home. In the year 1999, the only Internet access at home was using a dial up 56 kbps modem, after which the next alternative was a 128K ISDN line followed by the so-called 'leased line' at incrementally higher cost. The availability of a 2 mbps home Internet connection has made a huge impact on the healthcare sector, allowing for decentralisation of its staffing and innovative uses of telemedicine.

From the perspective of our niche industry, the overall success story of BPO/call centres, resulted in an increasing credibility of the offshored model and an understanding of how this could be both effective and cost-effective, which impacted in the form of increased awareness and acceptance of the model.

Finally, the advent of mobile broadband and availability of high speed wireless cards allows for Internet access from anytime anywhere, making instant telemedicine a true reality.

India's global position in the Internet Age

India's strengths, which give it a unique advantage in the globalised Internet era lie in its large English speaking population, its relatively lower wage base allowing for a significant cost advantage, and in its large number of engineering and computer training (and also medical) colleges. The STPI, an organisation that allows IT-enabled services to grow and flourish by providing assistance at all levels to companies in this space, is an invaluable asset to companies such as ours.

The biggest Achilles' heel of our country is currently our poor infrastructure, manifesting itself as power outages, or crowded streets with poor public transport. Periodic strikes and bandhs are a scourge that destroys our credibility, given that we are a mission critical operation running 24 x 7. When employees fear for their security to come to work, operations are affected and the company loses credibility on the international stage.

I see Telemedicine, specifically Teleradiology as a big opportunity for India in this time of physician shortages and specifically radiologist shortages. Distance education –if effectively implemented, can address the shortage of trained teachers and extend the reach of teaching programmes to a large extent. Here again there lies great opportunity for India, particularly in the healthcare domain, given the critical shortages of sub-specialist teachers in most medical subspecialties. Healthcare IT development is another growth area with tremendous potential, given both growing domestic as well as international requirements.

Some of the risks to India include potential changes in US federal policies in order to limit outsourcing by US corporations. Rapidly rising wages in India are another source of concern in that they effectively make outsourcing non-competitive, given other infrastructural challenges that increase company overheads. Finally, in terms of healthcare delivery, there is the issue of malpractice risk – which is not insignificant when delivering high-end services to litigious regions such as the US.

Telemedicine organisations in India

Organisations such as Apollo Hospitals have done good work providing primary care telemedicine services to some of the poor and deprived districts of Andhra Pradesh. Aravind Eye Hospital has a teleophthalmology programme that allows for early detection of retinal disorders in the field. And the Asia Heart foundation conducts telecardiology projects with coronary care units across the country, allowing for the effective treatment of heart attacks even in the periphery. RXDX centre is partnering with Cisco to deliver quality healthcare to people of Raichur district using the highend Cisco teleconferencing platform.

Our experience has been that the business model for telemedicine in India has still not mature and so it is difficult for providers to sustain the costs of infrastructure delivering telemedicine services over time (in contrast the CSR or Robinhood model works perfectly well, as in the case of the Telerad Foundation). The fundamental lack of awareness of the potential of telemedicine among potential users is a significant barrier to its growth. Local politics also plays a role, and the protectionist attitude of some physicians (who believe that telemedicine will result in a loss of revenue) is a barrier to the growth of telemedicine services. Finally, technology and infrastructure issues such as unreliable bandwidth can result in significant loss of credibility to telemedicine programmes, especially those that deal with emergencies or are otherwise mission critical.

The Road Ahead: The Next 15 Years of the Internet in India

In the next 15 years, the Internet will begin to play an important role in healthcare delivery in India, as well as in enabling our country to provide services globally. Healthcare portals will take on greater role in providing information related to health issues and in connecting users to providers. Telemedicine over the Internet will provide us with the opportunity for virtual consultations without stepping outside our homes. Medical education will be transformed as more and more training will become available online. The government will benefit through public private partnerships with organisations such as ours that maximise the reach of the Internet for both healthcare delivery as well as training.

Organisations such as ours provide physicians trained overseas an opportunity to return home secure in the awareness that they will continue to have the same level of professional practice and remuneration that they have been used to while they were in the West. In the past many radiologists hesitated to return to India from the US because of such concerns. The standard of radiology practice in our country will be benefited by the learning brought back by these returnees.

India stands to contribute in no small measure to the overall healthcare metrics of the world, given our tremendous manpower resources. The key challenges lie in training effectively and efficiently and in overcoming the infrastructural obstacles that we face today.

Recommendations for the Future

I would recommend to the policymakers that they should give priority to increasing the penetration of bandwidth and reducing its costs, including streamlining of the process by which broadband spectrum is allotted.

Additionally, policy makers should recognise and support the use of technology to teach and train paramedics, healthcare IT personnel etc., instead of remaining fixated on traditional classroom-based learning modules, which are limited in their reach.

Finally, policies should be formulated that allow resources available in India to flourish, i.e., niche companies with domain knowledge, rather than just working with large companies/firms, who already have established market share.

I would recommend that industry focus on technology and infrastructure for power generation, e.g., solar, wind energy and low cost computers so that technology usage in healthcare can be optimised by having power to run the computers.

Industry should also work on developing low cost telemedicine and teleradiology softwares, to bring down the cost of image transmission and make it affordable at the periphery.

Finally, the healthcare industry should work on low cost digitisers to enable digitisation of non DICOM (analog) images from older legacy systems of which a significant number are still in existence and use. This will facilitate the growth of teleradiology.

Regrettably, the utilisation of the Internet by Indian medical schools is inadequate and sub-optimal to date. Students typically access teaching websites to get information, however, it is not in the form of an organised or structured programme. In this regard, two highly successful initiatives that may be mentioned are the Heartstrings e-learning module in Pediatric Cardiology, and the Radguru teaching website of Teleradiology solutions both of which allow the reach of learning to be extended through the length and breadth of the country and beyond.

My recommendation to educational organisations would be to seize the opportunity afforded by the Internet and to make education more accessible and of higher quality across the board. This must be in the form of acquiring e-teaching infrastructure, implementing formal distance learning modules, developing online content and engaging the students in the process of online study, by educating and sensitising them.

References

Evaluation of JPEG and Wavelet Compression of Body CT Images for Direct Digital Teleradiologic Tranmission, Kalyanpur A, MD, Neklesa V, Taylor C, Daftary A, and Brink J, Radiology 2000, 217, 772-779.
Kalyanpur A, Neklesa VP, Pham DT, Forman HP, Stein ST, Brink JA. Implementation of an international teleradiology staffing model. Radiology 2004;232:415-419.
Wachter RM. International teleradiology. N Engl J Med 2006; 354: 662-663.
Kalyanpur A, Singh J, Tan L, Goh T. Impact of Teleradiology on clinical practice and workflow: benefits of a Singapore India Teleradiology link. BJR Congress Series Published by the British Institute of Radiology, 2-4 June 2008, Birmingham, UK.
Kalyanpur A, Weinberg J, Neklesa V, et al. Emergency radiology coverage: technical and clinical feasibility of an international teleradiology model. Emerg Radiol. 2003 Dec;10(3):115-118.
Burute N, Jankharia B. Teleradiology: The Indian perspective. Indian J Radiol Imaging 2009;19:16-8.
Kalyanpur A, Singh J, Bedi R. Practical issues in picture archiving and communication system and networking. Indian J Radiol Imaging 2010;20:2-5.
Kalyanpur, Arjun, Latif, Firoz, Saini, Sanjay and Sarnikar, Surendra, Global Teleradiology - An Internet-Based Application for Optimisation of Health Care Delivery Across Domestic and International Borders (January 8, 2009). Available at SSRN: http://ssrn.com/abstract=1346395

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Chapter 22

Frederick Noronha

Development Dialogues on, for and via the Internet

Editor's Note

This chapter provides case studies of two popular email-based news and discussion services, GoaNet and BytesForAll, started in the days of humble dialup modems. On the upside, the Internet has opened up new work possibilities for freelancers and created local and global discussion forums but on the downside also opened the door to spam and porn. The 'gift economy' of the Internet is an unparalleled asset, but calls for the precious time and energy of volunteers to maintain delicate balances between content quality and free expression. BytesForAll shares ICT4D news in South Asia and has helped build discussion and cooperation between a number of activists in the region. Challenges remain in India in creating local language discussion forums, especially for rural users.

Cyberspace is truly enigmatic in its being. Last month, in what seemed like the blink of an eye, some 13 years passed by of my involvement with the Internet. One can't help but have mixed feelings. After years of our existence on it, people suddenly take notice of the text or the photographs you might have posted online. For long, it seemed as if these things did not even exist. And when one has forgotten all about it, after a long wait, the queries start coming in. Sometimes the queries are strange. They could range from the best way to sell paneer in Goa (from a vendor in Hyderabad) to the colossal task of finding a life-partner through cybermatrimonials column linked to Goa!

My own romance with cyberspace started without much of a warning, andwas of a kind which perhaps enfolded other stories within it. Just when I was venturing into a freelancing career, sometime in 1993-94 – amidst all those dire warnings from colleagues that things would simply not workout - the Internet was becoming a reality.

In Goa, an email address was still an oddity. In 1990, my earlier employer, the Bangalore-based newspaper Deccan Herald, was farsighted enough to compel its outstation staff to use laptops. We dialled in our reports to Bangalore, via ultra-slow 300 bps modems, over costly telephone lines.

Four years later, Professor Gurunandan Bhat at the Goa University was showing us one of the first Mosaic browsers. Looking back now, we could never fathom we were witnessing the onset of something as powerful as the Internet. Web pages and tonnes of information were now becoming available to just about anyone, even those who did not possess much technical skills to access it.

Spam and porn was hardly as ubiquitous as now

One story worth recalling is how I invested in my first modem, sometime in the early 1990s. Those were days when one needed permission from the telecom department before attaching a modem to a phone! And now i.e., a few years earlier, when I spoke to the telecom authorities, they did not have a clue as to what a modem was. "Something like a fax," as one of them put it.

Coming back to the story, it was a US Robotics modem, bought from friend Joseph 'Boogie' Viegas, a tech-guru and early pioneer of cyberspace. Boogie, with whom I had a very public but fortunately temporary cyberspace spat later on, had then set up base in Alto Porvorim's still green hillock. He has since moved on to other pastures, in another sense, to Canada.

Modems at that time were very costly, and a 14.4 kbps modem was charged at Rs 14,000. But yes, the risk was well worth it, even if it meant spending a large chunk of one's life savings then!

You can now buy a modem that is nearly 18 times faster for almost one-tenth the price. But the early investment helped me to venture into a new field, to expand my vistas and make freelancing viable. It even allowed one to engage cyberspace at times when everyone out there seemed far more helpful and far less cynical.

My first involvement with networks in cyberspace was via Goanet, which just completed 14 years of its existence in end-August 2008.

Goanet (then spelt as GoaNet or even Goa-Net) was, and is, largely an electronic mailing-list based operation. It also has a website (www.goanet.org). I learnt of it thanks to Canada-based Tim DeMello, who explained its working via a letter-to-the-editor in the Ashwin Tombat-edited Gomantak Times. One thing lea to another, and I wouldn't be wrong in saying that it was love at first sight with Goanet.

As a journalist, my first thought was about how this new medium could widen possibilities for expressing ourselves and for free speech. As every journalist would confirm at some point of their career that they are often met with obstacles which somehow prevent 'their story' from getting told. Whether it's blocked by a lack of space, an editorial decision, or whatever it may be, but this happens all the time.

The dream started working. Maybe subconscious wishes do get translated into action in some deep, mysterious manner.

With the help from a Mumbai and Delhi based NGO-backed initiative called IndiaLink, I had, only months earlier, got access to the Net. To access cyberspace we had to dial up all the way to Mumbai and access our mailbox.

We usually did this once daily, after 10 pm, to benefit from the off-peak late-night lower rates. Fortunately, those were still pre-spam days. Yet, we kept our fingers crossed each time we dialled out, hoping that there would not be "too many" messages, clogging up our in-box.

Soon, one managed to get as allies, the enthusiasts of the Herald International Review. Goldwyn Figueira, Agnelo Rodrigues and Susan Fernandes of the Review team agreed to officially share news from Goa, out into cyberspace. Newspapers managers were approached by another, then a Goanet volunteer, Eddie Fernandes. But they were thrown off balance by the lack of a logical revenue model here.

Vishwas Chavan, then a scientist at the Dona Paula-based National Institute of Oceanography, had already been sending out news. He did so more as a volunteer than as a journalist.

On joining, Goanet founder Herman Carneiro surprised us with a 'welcome to the list' message, that went out on-list. Everyone used to get a welcome message in those days, even if it was a cc (carbon copy) posted to all new members and the list.

Eddie Fernandes, who currently runs the neatly-crafted Goanvoice.org.uk, was one of my first contacts from overseas who got back in a detailed way. Being at that time an engineering librarian at the University College London, he was for a long time very helpful in sharing information and inputs. (Now, he has his own 'baby' to care for, GoanVoice, which he tends to very carefully.)

In no time, he sent across a cassette tape - he chose this as the medium to share his thoughts with me, instead of writing a long letter! Then, he also shared some 3.5 inch disks of news clippings relating to the reports on Goa, going back to the 1980s, a valuable trove of information in those pre-Internet days.

Some later entrants to cyberspace believed that there were vested motives behind a belief in sharing. Taking part in the 'gift-economy' where we share our abundance, specially digital 'goods', which don't get depleted by sharing - benefits us all. And none of us has become poorer by it.

Without doubt, I personally gained a lot. Even from freelance assignments (thank you James Almeida!). But it would be untrue to say that I got involved in cyber-sharing with some grand plan of benefiting from it personally. Whether its yield returns or not, I would probably have continued participating in the gift economy one way or another. It does lend a whole new meaning to my life.

Along the way, friends on Goanet decided I could do with a digital camera. It then cost around two hundred dollars, and was one of the early models, an Agfa e304.

If I recall rightly, it took pictures of low-resolution and each photo-file was of maybe under 100 Kb in size. Yet, this allowed me a head start in sharing photographs online, which also impressed many people including the likes of politicians like the BJP's late Pramod Mahajan when he once visited Goa! Today, I share over 16,000 photos of Goa via goaphotos.notlong.com - and feel I have more than made up for this early gift.

In this way, contacts were built one by one. Every link was like a giant step into cyberspace.

Friends like Ulysses 'Uly' Menezes created a neat and impressive web-page with my photographs of Goa. Marlon Menezes, the guy behind the pioneering Goan-Web (the first web-site focussed on Goa), GoaCom.com (in part) and GoaCom.org was also supportive and we worked together for a long time. Sharing news, tech skills and server space was something that worked for quite some length between Marlon and us.

I subsequently became part of the Goanet Admin team, helped send out 'news' from here, and aided to organise the almost-yearly Goanetters meet here.

But managing to do something positive in cyberspace always depended on having a suitable team. There were many. First of all Herman, Eddie and Marlon themselves, Bosco D'Mello, Vivian(a) Coelho, Sunila Muzawar, Avelino in the Gulf, Christina who looked after the CyberMatrimonials listings, and many others. While we may have disagreed, or even shared harsh words, it was a pleasure to get to know one another and work together. It was fun while it lasted.

In 2006, about a dozen years after Goanet was born (and maybe 11 or so years after my first involvement with it), a query raised by one reader made me think. He said something to the effect of, "It's a fine job you guys (the Goanet admin team) are doing... but have you thought about who would follow in your footsteps once you guys are no longer there?"

Suddenly it struck me. Eleven years in the cockpit is a long time. It was time to move on and pass on the baton, hence I did so without bitterness.

But de-addicting oneself from an interesting project like Goanet is not easy. I try to keep up my involvement there, but in varying ways.

It was young Herman's initiative that showed us the way. Without doubt, this experience helped build up other ventures in cyberspace.

We applied the Goanet concept to start half-a-dozen or so of village-based Goa networks. There were many others too, dealing with networks (like the ones promoting Free Software to writers' discussions, and others working on greenery and Goa-Research-Net). BytesForAll was another such venture, which I shall describe in greater detail below.

So, any regrets about leaving GoaNet? A few. But these can never out-shadow the many things that went right.

The typical Goan bitterness and backbiting pushed me earlier-than-expected towards finding topics other than Goa to focus on, in my writing work.

Criticism came from some quarters and left a bitter taste in the mouth. Rather than fighting over a small cake, we should try to bake a bigger cake (Goa-linked online content, in this case) and make it available to all.

My second regret is about the manner in which dreams get hijacked and taken over.

When we criticised Goa, it was neither because of our hatred towards the place, nor a justification for leaving this region. Over the time, the criticisms that toned my reportage in cyberspace seemed to have become useful cannon-fodder for people with various agendas. Whether it be making a case of why Portuguese colonialism wasn't really that bad, or critiquing one political party to subtly show that another is indeed superb!

My last regret is that Goanet today seems to be becoming a victim of its own success. Its free-speech policy means anything goes onto it. With its membership growing (almost 12,000 across its diverse lists), more people are finding it a useful soap-box through which they can peddle their message.

It is a dilemma of how to ensure that 'editorial control' does not block the debate, while at the same time ensuring that quality and non-repetitive posts get preference. Of course the question that would always be asked would be: who defines quality?

Despite all this, there are many reasons to be optimistic. I have learnt from cyberspace, and it shaped my approach to work and communication. To everyone that shared this journey, I owe them a great and un-repayable debt. Cyberspace has a role to play in complementing and supplementing what the media is doing in Goa.

As mentioned earlier, another project initiated on the way was the BytesForAll email newsletter focused on digital inclusion and digital dividends. It started in 1999; for some reason the monsoons in Goa have been a productive time for me! It was a simple, almost cut-and-paste idea. Some of our earlier issues are still online (Our second digest from August 1999 is at http://www.nettime.org/Lists-Archives/nettime-l-9908/msg00056.html).

My thinking was: with so much probable IT talent in India, why was so little being used to solve crying local needs? The idea was to highlight examples that worked back home, and share just the awareness of the same. We did manage that, and more.

After I culled content to create a simple e-zine, Partha Sarkar from Dhaka, Bangladesh, came up with the suggestion that made the project take on a more ambitious role and shape. My plan was to put together three to four electronic newsletters.

At its peak, BytesForAll had about 15 volunteers from six different South Asian countries which is not a small achievement, but eventually, we lost steam and perhaps resigned to the fact that our best years lie in the past. Some have moved on to other ventures, contributing in very different ways.

We managed so without any organisational funding, and based our operations on the principle of each one of us volunteering some time each day. That was more or less a deliberate choice. Over 1,500 people read our mailing list (on Yahoogroups). It reached a whole number of influential places - from Prof. Ken Keniston in MIT to the ill-fated Media Lab Asia. I was not aware that we had readers in Microsoft Research India, an institution linked to a multinational whose policies on software I have long been critical of, till we got talking over some journalistic work!

It is very soul satisfying to have played a role in highlighting the potential of what came to be known as ICT4D in a country with the challenges and problems such as India. On the other hand, we might have also helped to pull in some of the wasteful if not misdirected funding that the ICT4D field attracted. It might have been far more beneficial if the debate was shaped more in a way that made a real difference, rather than just funding allocated to good intentions.

It was not a part of any well thought-of plan. Often, I have acknowledged that BytesForAll was a cut-and-paste aggregation idea, for which the credit should not go to us. We took bits and pieces of existing initiatives, recombined them in a different way, and presto, it worked!

Its name itself was inspired by XS4all, the Dutch alternative ISP which evolved into many new things and grew in diverse directions. Its volunteering nature was based on the Free Software model of different people contributing one small bit to a larger project.

But while we were at it, BytesForAll did spread a useful message. We highlighted initiatives like Sugatha Mitra's hole-in-the-wall project (which showed the ability of the urban poor youth to teach themselves computers), and raised debates over Free Software and community radio. BytesForAll helped build bridges for debates and partnerships between IT communities across South Asia - especially India, Pakistan and Bangladesh, and also to Sri Lanka, Nepal and Maldives.

Some of the dozens of issues highlighted over the years in our newsletter include:

IT for the handicapped;
IT for villagers;

patent regime challenges in emerging economies;
IT and tribal communities;
IT for the non-profit sector;
ICT in microenterprises;
Internet diffusion irregularities;
Linux growth in South Asia;
future scenarios of ICT evolution;
best practices in Internet governance and regulation;
keyboards for South Asian languages;
ICT partnerships between development agencies;
community radio via Internet;
village knowledge centres;
Wikileaks and global whistle-blowing sites;
job announcements for telecentre managers;
calls for conference submissions;
celebrations for Wikipedia's 10th anniversary;
cybercrime and cybersecurity challenges for developing countries;
recycling of old computers;
poverty alleviation via ICT4D;
social innovation competitions and awards;
ICT4D case studies and project assessments;
Internet addiction;
disaster reporting and relief coordination via the Web and SMS;
low cost computing; cloning Silicon Valley in developing nations;
announcements of ICT4D workshops and lectures;
e-waste management;
success factors for PPP partnerships;
spam filters and legislation;
and announcements for ICT interships!

But BytesForAll should not be seen as an end in itself.

Not only did it focus on ICT4D initiatives, and offer new ways of volunteering in a socially-networked world, it also helped inspire other initiatives. Our experience there led to the launch of a range of electronic mailing-lists, and to highlight the potential of others. One such mega-listing points to a range of electronic mailing lists in India, some of which you would not even believe exist (http://wikiwikiweb.de/MailingListsInIndia)!

Such initiatives helped us get more alternative communication happening at the all-India level. Of course, this is but a drop in an ocean, more so in a country with a billion-plus people, with a range of diversity.

We need to recognise that India lacks sufficient communication, more so at the alternative level. The simple low cost, unglamorous technology that everyone ignores - email and mailing lists (built on email) - helped to share ideas and bring concerns together. Further, BytesForAll, when it was active, turned out to be a true information and knowledge-sharing network, specially in South Asia (a region whose legacy unfortunately includes mutual distrust and suspicion). You could call this South-South cooperation in action, going beyond cliches.

There is a lot of scope for optimism, as more people get online, and find it easier (and, crucially, cheaper) to communicate. One big challenge of course is how to cut through illiteracy (still afflicting many in South Asia), language diversity, and the reality that we in South Asia prefer oral communication rather than written (let alone digital!).

Youth hold an immense potential. While some are pessimistic about the future generation, I see them as offering a cause for optimism. Let us not forget that even in the much-praised "earlier times," it was only a tiny minority of students who were searching and looking beyond the obvious and the pleasurable. We need to find that segment of students now too, and be able to tap their interests and build upon it.

It is unlikely that they would have the same priorities of one generation or two ago. But they are committed to what they believe in, and are innovative in their manner of working.

But definitely, a lot remains to be done too. If the Net is to be a better tool for India, it needs to be more accessible, more focussed on local Indian-language content, more relevant to the lives of the millions, and handle gender, caste, class and other divides that we see among our people.

The Net has shaped our habits so much, that most people read fewer books and more of email, websites and other e-content. Ironically, I have been learning from an Internet magazine called SPIDER that comes out of Karachi in Pakistan - while India itself lacks a decent (or any!) magazine focussed exclusively on the Net!

Look hard enough, and you will find a silver lining, however.

The Net, while distorting our reading habits, has created options of its own. In some ways, better ones too. Whenever stuck for information on the Net, there are so many techies one can ask via networks like GII-India. So many of my young friends, the twentyone-year-olds as I call them, are able to help me with useful tips and helpful information whenever I interact with them via cyberspace or one of our Free Software e-rounds.

To complete the circle though, a young researcher like Subbu Shastry deserves credit for making it far easier to keep track of these - or just about any - issues. You just need to list your issues on http://www.newsrack.in and it acts like a Google news-alerts service for India!

In sum, for all those working on development issues in India, it would be definitely wrong to see only scope for pessimism on in the Internet frontier.

Fred Noronha, based in Goa, has been a professional journalist for over 25 years. He has received many credits for his work including Panos Fellow in 2001 (reproductive health and gender issues), Sarai Print Media Fellowship 2001 (studying the contribution of South Asia to GNU/LINUX), co-founder of Bytes For All - a widely appreciated site and e-zine studying the use of IT and Internet for development, member and administration team for the GoaNet mailing list for expatriate Goans world-wide, and founder member of India-Linux Users group. His authoritative pieces have appeared in Indo-Asian News Service, The Telegraph (Culcutta), The Herald (Goa), Third World Network Features, Radio World International US, Inomy (Internet News), ZDnetindia.com, Dawn Science and Technology Page (Karachi), Deccan Herald (features) and Goa Today (Internet column). Mr Noronha holds an M.A. English Literature and a Bachelor in Commerce from University of Bombay and an Advanced Diploma in Journalism from IIJ-Berlin.

Chapter 23

Nirmal Jain

India Infoline

A Story of Internet Transformation

Editor's Note

This chapter claims that no other industry in India has been impacted by the Internet as much as financial services and within that, the stock markets. 90 percent of the stock market's size in India came into existence only in the last 15 years, powered in part by the Internet revolution. The Internet has helped create new players, like IndiaInfoline, and democratised equity trading for the common man in the stock market. The key success factors for startups are deep domain knowledge, solid technology, a blend of offline and online strategies, close contact with customers, ability to handle management challenges of organisational scaling and effective branding. Flexibility and agility can also make up for lack of clarity in vision in the early stages. For further success, India's broadband penetration needs to increase, along with increased rural awareness about the Internet.

Those who have been in the stock markets for two decades or more will appreciate the way stock markets have metamorphosed in the last 15 years. In such a short time, we have seen markets leapfrogging from an open outcry floor trading exchange, a closed club of all powerful brokers, jobbers and sub-brokers, a system of weekly settlement, opaque and rigged *badla* (stock trading) to world class, modern, well regulated, transparent, and efficient markets. In other words, earlier, shares were sheets of paper, bids were shouted out and trades were scribbled. The Internet brought radical changes to the stock market. Shares were dematerialised, bids were punched on the computer keyboard (and now mobile screens as well) and trades were matched on the screen.

This was beyond the wildest dreams of the market participants, even in the early 1990s. As a result, the typical difference between what the buyer pays and what the seller gets has come down from 5 per cent-7 per cent to 0.5 per cent-0.7 per cent. More importantly, trading has become far more easy and efficient. Earlier, there were chalked telephone lines where buyers would typically place their orders a day in advance and physical contract notes and bills would come after a few days and in some cases after few weeks. But now, mobile trading, which is another convenient extension of Internet trading, has brought trading at your finger tips. Equity cult was largely restricted to cities such as Mumbai and Kolkata. Today, geographical borders are not even considered as speed bumps on the Internet. There were different stock exchanges, huge price differences and buying and selling were handled by the stock trader or a stock investor who could manipulate stock prices with legal sanctity.

Investors ran all kind of risks; prominent among them included fake share certificates, huge delays, cumbersome paper work of filling up transfer deeds, sending physical certificates, inability to sell shares till they came back after transfer – this process could agonisingly stretch for up to three months at times. It was then impossible for authorities to track market manipulation or identify the actual buyers and sellers. Understandably, it was not the place for small investors. In fact, before 1994, the stock market was notoriously known as nothing more than a 'small closed BSE club', which controled the market. We all know how stock markets function today, with real time checks on risks, T+2 settlements, almost 100 per cent foolproof with no defaults, dematerialised shares, screen based price discovery, et al. All this has been possible primarily due to revolutionary changes in technology, with Internet being the key catalyst.

Technology and the Internet, while making markets efficient and consumer oriented, have also brought unthinkable changes to the pecking order of the industry. For reasons of evolution, inheritance and pedigree, banks and financial institutions/financial services organisations would evolve and grow over generations. It would not even be thinkable for a new incumbent player to challenge the established organisation and financial services players. Now, when I look back at the last 15 years, it is indeed amazing and incredible how quickly an Internet startup like India Infoline (IIFL) could emerge as one of the leading financial services companies in India.

In the history of mankind, there have been many disruptive inventions, which have either acted as great driver or catalyst for a major paradigm shift. Under the steady state of things, the financial services business would be like any FMCG industry with products like Coca Cola or Lifebuoy. It is not easy for a new player to challenge the incumbent and reach a leadership position. In the primitive stages of growth of mankind, physically weaker people would do farming while the stronger ones would moderate them by providing protection, given their ability to bully. The invention of the gun made stronger and weaker people equal. The invention of the gun was great catalyst of those times. Like many other industries, Internet is a catalyst for financial services.

A brick and mortar mindset restricted capital market participation to a privileged few. In the early days, if a fund like Morgan Stanley would place an order for 100,000 shares and a small investor would place an order of 100 shares, the broker would obviously prefer to cater to the bigger customer. He would be in a position to give much better service to the large fund.

However, with the Internet, it virtually makes no difference on cost if one order of 100,000 shares is placed or 1,000 orders for 100 shares each are placed. This is called democratisation of information and equity trading. We could see these changes coming and sensed a great need for empowerment of retail investors. The retail investor is now on a level playing field with large mutual funds and institutional investors in terms of brokerage and service quality. Moreover, retail investors are also at par with institutional investors in terms of availability and access of price information. Today, even small investors or market watchers can easily get instant information and latest prices on the Internet, TV, and mobile phones. It is not surprising that retail investors in small towns in India are abreast with the happenings in the US or other markets, including regional markets.

India Infoline: Context and Growth

To be successful in the Internet space, it was not necessary to have the first mover advantage or to be the pioneers. We did pioneer online trading in India, but when I look at my own story I realised that I may actually have been five years behind the global phenomenon. I was fortunate to have readily taken a big bet on the Internet. We entered into the Internet space at the right time in India and took the right steps along the way to bring our business to the present level.

I would not be honest, if I were to say that I could see the opportunity presented by the greatest revolution of our time, the Internet, and could imagine that financial services would probably be the best match for the Internet space. I may also receive applause for having the "vision" to see these changes and capitalise upon them to create one of the largest financial services companies in India in just a decade or so. But the reality is that vision is more like 80 per cent hindsight and 20 per cent foresight! When we started, I had not dreamt of this. We had a direction but that kept changing. We took one day at a time, kept moving, changing course to survive the challenges and seize the opportunities. We were flexible. We were agile. But not the visionary to dream and make the dream come true. So let me start from the beginning.

Soon after my MBA from IIM Ahmedabad in 1989, I joined Hindustan Lever. I was always interested in the stock market and started investing on a small scale. The Harshad Mehta scam gave the opportunity to see how rapidly a small pool of money can grow and more importantly, it taught me a lesson that it can disappear even quicker! I started reading stock market magazines and newsletters and started analysing companies and sectors based on whatever data was available. Given my strong finance background and interest in the stock market, I was comfortably able to make sense of the data and this excited me further to understand the ups and downs of the stock market values.

In early 1994, I got introduced to two brokers who were looking to set up their research team. In those days, there were no experienced research analysts and I took up the opportunity of starting a research desk for them. In 1994, I saw huge potential in building a business on the premise that most of the brokers will set up their own research and cover top 200 stocks, which used to account for more than 90 per cent or 95 per cent of market volumes. This could be side-stepped, if somebody did quality research and supplied this research to them for a fee. With this idea, I set off to launch my own business in 1995. Initially, I began with two other professionals as co-promoters. On October 18, 1995, Probity Research and Services Private Limited was formed the name was later changed to India Infoline Limited.

Starting as an independent research firm, we did not have thoughts of ever getting into broking or insurance kind of businesses. At that point in time, you may find it amusing but, I had not even heard of the Internet!

From 1995 on, India had a recessionary environment. Stock markets were not doing well and it was really difficult to sell research reports for a fee. But given the hard work and quality, we could manage to survive and even grow. In 1998, we were the first to publish our comprehensive report on the Indian IT sector, which was titled 'Hope, Hype or Happening' and it argued very strongly in favour of the IT sector doing extremely well over the next 10 years. That report became an instant hit and we saw the first tipping point in our revenue curve. In 1999, our revenue was around Rs. 1 crore and we would have made a net profit of around Rs. 15 lakhs, which perhaps was then good for a small team of 10-15 people.

While researching for the IT report, it also dawned upon us that that the Internet was catching on like wild fire. The more I read and understood about the Internet, it became clearer to me that the Internet by itself was not a business but an inner pillar, which is a need of every business . So I decided to take our financial services company to a Web-enabled model. We had about 250 clients and maybe about 5000 people used our research as people used to conveniently photocopy and distribute the reports - and given Indian laws, it was very difficult to control this practice.

One of our team-mates came up with the idea that if we are selling our research reports to 250 clients and around 5,000 people end up using it, then why not give it away free to 5 million people! The argument was that if we could charge even 10 paise it may recover our cost. But that meant we would have to forego our revenues of Rs. 1 crore per annum. It also required investment and technology. In short, it meant that our business required a reincarnation. For this, the pre-requisite was death. The idea was literally implemented and the old business model was killed with a historic print advertisement (reproduced in the box)!

Looking back, it was quite a courageous call indeed. Had it failed there would have been no comebacks. But then the idea and our confidence were too compelling to worry about the consequences. Our company took off like a rocket.

We had our shares of laughs too. Early in the morning people were frantically searching for the home page. Business Standard was carrying an advertisement to announce the launch of www.indiainfoline.com and the landing page had disappeared. Needless to say, it was found that the programmer had hidden it to protect it and had dozed off near the reception without informing us! On May 11, 1999, Probity Research became India Infoline.

The company raised about US$ 1 million from a private equity fund and launched its website (www.indiainfoline.com) in May 1999. The website was launched within four months of conceiving the idea, at the Internet speed in those days.

The India Infoline Impact

The India Infoline website became instantly popular but the business model or monetisation of the website was not clear. The company started selling banner ads but soon realised that this is not a business model that we could scale up or generate growing stream of revenues over a long period.

Meanwhile, people across the world were paying for financial information and research through transaction fees or brokerage. The traditional brokerage industry was offline, driven by relationships and personalised service. We took a calculated risk and felt that financial services and broking were the businesses cut out for Internet. A paradigm shift was waiting to happen. We successfully launched our own online trading platform the 'Trader Terminal' and powered the trades through our dedicated trading website http://5paisa.com in July 2000. We made major investments in technology to enhance the investor experience.

This was the start of a revolutionary change in brokerage pricing; slashing charges from the traditional 75-100 bps to 5 bps and offering an amazing mass customization of services. Moreover, our use of technology and the Internet extended the trading facility from a broker's office to the customer's residence or office desktop. What the Internet did was shift the locus of control of trading from the broker to the customer. The Internet empowered our clients to place orders directly on the exchange. Our trading platform had an apt caption – Making Fortunes On Your Screen!

But on the global landscape, there was misfortune in store - especially for the Internet and technology companies. The crash in the NASDAQ saw dotcom companies vanishing into thin air. This put an end to all funding and the stock market saw one of the most trying times for most market participants.

We had to face competition from many large players seeking to grab their piece of land in the financial information space and in fact, determined to crush small obstacles like us. We remained focused on our strengths in technology and research. Rolling out technology all over the country, removing teething troubles, stress-testing with loads, perfecting the risk management and security took considerable time. It was only by mid-2003 that the product became robust and widely acceptable. With the success of Trader Terminal, the company's customer base grew rapidly and the company turned around in 2003-2004. In the years to follow, the profits grew exponentially.

Along the way, we partnered with the Bombay Stock Exchange and educated investors on futures trading by launching a real-time simulated futures trading game. Live feeds and breaking news was provided to those who wished to try their luck without burning any money. The winners got expensive gifts and the losers gained experience without losing a rupee. That is when I first got formally introduced to Mukesh Ambani.

A lot of our initiatives with the Internet forever changed the way shares were bought and sold in this country. Firstly, we put all our research on a website for free access by all our users. We then took the bold step of bringing brokerages down to rock bottom levels and developed a Trading terminal, which is as powerful as a Bloomberg terminal for retail investors. I must admit that the change was inevitable given the rapid pace of growth in technology and spread of the Internet. We happened to be at the right place, at the right time and therefore emerged as one of the leaders making these changes happen in this country.

Financial services products are best suited for the Internet as you do not need to touch or feel the product like consumer durables or clothing. All that was needed was to understand the product and this made financial products much easier to be bought and sold on the Internet. In fact, given a choice, many customers prefer the Internet for privacy, confidentiality, access to a lot more information, convenience and transparency.

Challenges

In spite of the easy acceptability of the Internet, we faced quite a few challenges in this space. Even if you invest in the best server, bandwidth and connectivity, the customers' experience will only be as good as the last mile and in many places the last mile connectivity still remains a challenge. Given the shortage and erratic power supply in most parts of the country, clients would get frustrated when their computers shut down due to a power outage. Not many could afford to invest in UPS or an inverter.

Our typical client base was then between 35-50 years of age and while the younger generation was computer savvy and adopted the Internet a lot more, a significant number of our customers were less comfortable on the Internet. Often, they would share their passwords with their assistants, which could cause a risk to their holdings. While security, anti-virus and spam controls are improving, this still remains a challenge for a growing market like India.

Success Factors for an Online Business

The dotcom bust earlier in the decade caused more of a wipeout than a shakeout. In the Internet space, 9 out of 10 entrepreneurs, if not more, would have failed; it is not because they were lacking in intellect, hard work, commitment or even capital. From my personal experience, I would like to highlight two aspects critical for the success of a new business and more so in new technologies like the Internet space.

One is a deep understanding of the customer. Entrepreneurs often come up with brilliant ideas and they cater to customer segments they themselves can not empathise with. In our case, we were fortunate that both my colleague Venkat (who is also the co-promoter) and I were investors in the stock market. We have traded ourselves and knew exactly what a stock market investor or trader would need.

While we shifted to the transaction space, the relevance of knowledge did not diminish. In fact, it only gained further currency. Our premise was that to provide actionable information that is knowledge of companies and stock markets to customers. To ensure successful execution of customer transaction, one has to be thoroughly conversant with technology and stock exchange requirements, compliance, and risk management. To provide customer delight, we needed to know the customers themselves. This knowledge significantly helped in developing our first proprietary online trading platform.

Later, many other competitors would have emulated the features, but when we launched it, some of the unique features were streaming market quotes, very minimal delay (we worked a lot on mastering the data completion technology), instant order confirmation, charts, technical tools, ease of use and all features to be used with a click with minimal requirement of the mouse. We also introduced several unique query-based alerts or certain triggers, which helped typical market traders to look track closely like high–low, volume and momentum. We also integrated our research with the online accounts and the trading terminal to make it very powerful and easily accessible.

So while the Internet offered an opportunity in the financial services space, much of the success could also be attributed to the product which was a trader's delight. Again, it is always relative - the product, which was very good in 2003 may seem atrocious today. Now, as competitors also make progress, we have been continuously enhancing our offerings to maintain our lead and remain successful. As Google was extending its reach, there were concerns that our Internet presence would be diminished. Today, we are proud to partner with Google for various solutions and nothing beats the joy of seeing our content amongst the top on even the Google News page.

Secondly, it always helps to have first worked in a reputed and growing or large organisation. My colleague and I had worked with large organisations and therefore had learnt some lessons from life. It helped that both of us had a unique combination of an in-depth understanding of what retail clients need and how technology could be leveraged to meet the needs. Moreover, we also had a perspective of how systems, processes and audit worked. We had knowledge on how to build a good team and these are attributes, which become very important when you scale your organisation to higher levels.

We did rush ahead of our times in launching India's first e-Card and the then Chief Minister of Andhra Pradesh also known as the CEO of Andhra Pradesh, Chandrababu Naidu graced the launch event.

India Infoline listed on the bourses in 2005. People ask if after building a successful business and wealth if I am able to sleep well I say, "Yes, I sleep well. Sometimes I sleep like a baby, I wake up every hour!" As an entrepreneur you are continuously challenged and you are always driven and restless.

Organisational Transformation: From Startup to Scale

Every organisation passes through several phases. When it is just about 10-15 people you know every individual and their families well. When it becomes 50 people you have a couple of key leaders and you know almost all the people but may not know all their family members. When it goes up to 500 people you will still know the key leaders driving the business and when it goes to 5,000 and 15,000 numbers, the systems and processes become more important and then your ability to manage a few key relationships becomes as important as columns and beams in a superstructure of a large building.

Our CIO and HR play an important role in the management decision-making. Technology not only allows you to keep your costs low, it also enables mass customisation. The added advantage is that support functions like accounts, administration and HR can also run on it. Our front-office software was seamlessly integrated to an in-house back office and MIS software. This made it possible for back-office system to handle a significant increase in the volume of data without compromising on speed of response to its external customers.

A small startup can do without systems, processes, and audit but a company aspiring to become large cannot do without them. I have seen that many entrepreneurs who start early in life are quite cut-off from harsh reality. They are not able to visualise the opportunities as well as the challenges and they stumble many a times. Some of them take the help of a good private equity. However, private equity very rarely provides resources, which help in building the business well.

One of the distinguishing features of our evolution has been continuous investment in branding. I had started my career with Unilever, which survives and thrives only on brands. I was amazed to see that it takes several times more money to make a star smile and say she uses, say, Lux soap (which she actually does not!) than to set up a soap factory. I could see how that creates value. Therefore, I was biased and determined to spend money on branding. There were necessities to change focus of brands from 5paisa to India Infoline and then to IIFL. Although, I am happy that we spend on branding, I am not sure whether that was prudent or not. As one can argue, in the Internet world there are super success stories like Google, which has grown purely on the back of a great product and smart viral marketing with not a penny spent on advertisements.

In the development of the Internet, there have been various milestones. It began with the popularity of the Internet in the late 90s to decreasing prices, easy availability of bandwidth, huge investment in broadband by various players, availability of global bandwidth and data storage and server capacity at very affordable prices, and then exchanges allowing Internet-based trading. India is in a much better place in the Internet world as compared to many other countries.

Challenges

India has woefully inadequate infrastructure in terms of power, road, ports, and airports but she can significantly mitigate this disadvantage because of the Internet. The ease of transactions, improvement in productivity, and the new technology, not relying too much on cable, wire and infrastructure has helped India take much greater advantage of the Internet.

In the UK, for instance, share of online spends is up from 2.5 per cent in 1HCY03 to about 20 per cent in 1HCY08. In India, share of online ad spends is remarkably low, at about 1.5 per cent. While the multi-lingual demographic is a likely factor impairing growth in online ad spends, their market share is set to increase as broadband penetration increases. India's strengths are relatively less than the disadvantages vis-à-vis other developed countries in terms of the Internet economy. India has a large technically qualified and English-speaking population and there is a dominance of services in the economy where again the Internet is a huge advantage.

However, one of the major weaknesses includes a large rural base without connectivity or even Internet awareness. Very recently, the Internet has started touching the rural folks, though reports and surveys show over 80 per cent of the rural population in unaware of the Internet. What has been achieved is not even a miniscule part of what can really be achieved. They are still cut off from basic education and understanding of the necessities of life. There is inequality of income and poverty, bureaucratic, and political delays causing infrastructure bottlenecks affecting economic growth. There is immense opportunity since the global economy will continue to grow and India can take advantage of that (it is already in the leadership position in software).

Looking Ahead

In the coming 15 years, incredible changes will happen in India. The penetration of the Internet will increase significantly and the cost will fall. There will be many more applications that will come and many more innovations will take place in the industry. There may not be even a single business, which will not be driven by the Internet. For the last few years, jobs and marriages are getting fixed as never before on the Internet. All businesses will have the Internet as an integral part of it. Even huge land reforms, government activities, reduction in corruption, red tape, and improvement in collective communication will take place via the Internet.

While initially, we were very excited with the Internet, we also realised the need to have a physical and an offline infrastructure to support the Internet-driven business. Some are apprehensive that if we go offline, we would be diluting the positioning or value of the Internet platform. To my mind and particularly in the Indian context this is not the case. Internet penetration and broadband penetration is growing but it is not yet very wide and deep. It is therefore very important to have an offline infrastructure to attract clients who will adopt the Internet with you over a period of time.

Indian policy makers must understand the potential of the Internet to drive India's economic growth. Any attempt to regulate or levy taxes should be done and thought through many times, because more often than not the disadvantages would outweigh such policy changes. The government should also take the initiative and revamp the education system and increase literacy with the help of the Internet. If government encourages Internet adoption, it can help in curbing many social ills and drive the growth faster. The Internet can also drive the government's objective of inclusion as this is one medium where the rich cannot have any significant advantage over the poor if access is made easy and inexpensive. While the Internet may be an indispensable tool, one needs to realise that technologies keep changing and we need to move with the times. Internet may no longer be a core topic of discussion in the years to come as it will be just another necessity like electricity.

Earlier most companies added a ".com" to be more visible and ride the new economy wave. Today corporate sectors and individuals are hooked on to the social network. In fact, managing your Internet image is a serious business and a number of companies have sprung up who manage your profile for you in the virtual world. Whether it is the US President Obama broadcasting his few lines or CEOs of companies directly addressing queries and worries, social networking is changing our lives, slowly but surely.

Nirmal Jain, Founder and Chairman of India Infoline Ltd (IIFL), is a first generation entrepreneur, who is credited with building one of the largest financial services companies in India in just about a decade. A PGDM (Post Graduate Diploma in Management) from IIM (Indian Institute of Management) Ahmedabad, a rank holder Chartered Accountant and a Cost Accountant, Jain began his career in 1989 with Hindustan Lever Limited (HUL), the Indian arm of Unilever. He then set up equity research unit 'Inquire' and eventually founded his own independent research company, which is now known as India Infoline Ltd (originally incorporated as Probity Research). Today, IIFL has subsidiaries and offices in Colombo, Dubai, New York and Singapore. He is also passionate about contributing to the society, especially in the fields of education and healthcare for the under privileged, for which he has set up the IIFL foundation

Satyan Mishra and Nitin Gachhayat

Rural Business and the Internet

Sustainability, Profitability and Role of Governance

Editor's Note

This chapter discusses the intricate web of relationships and services that needs to be present in order to successfully support Internet access models in rural India. Villagers in India are seen to highly rely on a host of government programs and services that provide them access to basic necessities of life. There is a dual need for providing access to information and services at the village level while generating viable employment opportunities. In the Drishtee model, local entrepreneurs deliver ICT-based services to the rural population through a network of village kiosks. These kiosks provide user enhanced access for e-governance, education, health, insurance and local services. Drishtee offers its network platform to any service provider who wishes to market its range of services to rural India by plugging their application into Drishtee's software offered directly at the village level. At present there seems be no better way to spread the use of IT than by creating micro-enterprises around the technology. Emerging frontiers include rural BPO and e-commerce.

Villagers in India are highly reliant on a host of government programs and services that provide them access to basic necessities of life. For example, there are many government loan programs that provide credit on easy terms. There are also education, health services, and employment schemes introduced by the government for the benefit of the villagers. Since many government offices are located in the cities, villagers incur major monetary and time costs to access those services. Moreover, government employees take advantage of the powerlessness and ignorance of villagers through bribes and various corrupt practices.

The lack of information and access to services available in the cities also impacts villagers in non-government related areas. They are forced to use middlemen for all their economic transactions (including sale of their produce and purchase of capital equipment), which further reduces their income and increases their costs.

Traditional efforts at improving the situation of villagers in India have focused on providing these teeming millions with their basic requirements like food, clothing and shelter. As resources are scarce and requirements are ever increasing, this becomes an unsustainable concept. It is seldom remembered that "giving a fish" is not a solution in itself. What is needed is a fishing rod. Unfortunately, employment, often seen as the "fishing rod," leads villagers to migrate from their homeland. And the only employment in a village is tilling on someone else's land for conjuring two square meals a day.

Therefore, the solution lies in providing access to information and services at the village level while generating viable employment opportunities. To address this dual need, we initiated Drishtee - an India-based organisational platform for rural networking that provides IT-enabled services to rural and semi-urban populations.

Through a tiered franchise and partnership model, Drishtee facilitates the creation of a rural networking infrastructure. With nodes at the village, district, state and national level, Drishtee enables access to worldwide information as well as local services using its proprietary state-of-the-art software.

Local entrepreneurs use the Drishtee plaform to deliver ICT-based services to the rural population through a network of village kiosks. These kiosks provide users enhanced access to e-governance, education, health, insurance and local services. As the ICT center (kiosk) is owned and operated by a local villager, the model supports wealth creation by developing entrepreneurs within the village community. While providing various services at nominal costs, these kiosks have been found to be self-sustaining and profitable.

This has not only resulted in financial benefits in terms of reduced costs and increased incomes, but also other social benefits like access to education and health information. These kiosks are providing viable employment opportunities for unemployed rural youths and help stem rural-urban migration. The network platform is open to any service provider who wishes to market its range of services to rural India by plugging their application into Drishtee's software, offered directly at the village level.

Acting as the gateway to valuable information and services for villagers, the village entrepreneurs are driving the business model and this has been demonstrated in over 300 kiosks across 6 states in India. The aim is to develop Drishtee as the 'window to the world' for Indian villagers.

Drishtee's target customers live in rural India, a market of 700 million people, with aggregate discretionary purchasing power of 2 billion USD. An average villager spends about 80% on sustenance, with a large portion of the rest spent on accessing products and services available in cities. Drishtee enables access to these services at a fraction of the original cost and time.

Rural Governance

The involvement of different tiers of governance at different stages is critical to start and run e-government operations. While policy level changes at the central/state administration are a prerequisite to set up operations, the district collector plays a major role in evolving mechanisms locally to suit delivery. The state and the district authorities also need to invest in providing better back end processing. This is to ensure timely delivery of services to the citizens.

But investments in hardware and software are not enough as has been demonstrated in most of the experiments. It is continuous monitoring by the government of the entire process which yields the desired results. The Government also has to leverage its resources to provide ready funding for the kiosks from the banks. A variety of central and state schemes of financing are languishing on account of lack of viable business avenues at the village level. The ICT kiosks, with their inherent strength and sustainability, can definitely avail the benefits of existing resource.

The level of automation in delivery of the services related to the Government is a direct factor of the G2G network. The junior district officials at the Block (taluka) Level have to proactively participate in the delivery process, which could be a combination of manual and electronic process. The Government has to initiate a proactive campaign to make its governance efficient and electronic. This would necessarily include heavy doses of training, awareness programs and series of carrots and sticks.

For broad-based development, we need to have process-based governance not only in the corporate world but also in each geographical and functional segment of the government. Like in any other quality cycle, the entry points have to be checked first. The governance at the Panchayat, the Block and the District levels has to be made process-oriented from end-to-end. The rural effort has to start at the first and the last mile of governance, the top bureaucracy and the end citizens, and has to logically culminate at a fair distance from both.

The Road to Sustainability

ICT centres in Indian villages are known by many names. But the most popular terminology is 'Kiosk'. Initially a Kiosk was imagined as a self administered touch screen center which would be using multimedia sound and graphics to convey its message. But now the perception has changed and we can also imagine a person in the same Kiosk who operates a PC or LAN to service his or her community. This necessarily means that the information retail has given way to application servicing.

A Kiosk Operator has to invest in the range of Rs. 50,000 to 70,000 to own a Kiosk. In a majority of cases, he takes a loan from the bank and there is an immediate pressure to generate revenue to service the loan and to promote the services. On an average, it has been observed that a Kiosk is either established or uprooted within the first 6 months of operation. The Kiosk operator must be at least midway on his road to profitability within this period. His monthly income must range from Rs. 3,000 to Rs. 4,500 for him to remain married to the concept or for the community to remain interested in coming to the Kiosks.

On the demand side, let us attempt geographic segmentation based on parameters which affect the viability of operation. On the supply end, let us take a look at the existing and expected service streams and their revenue potential. We will also map the services streams with their connectivity requirements.

Broadly there are three parameters which impact the viability of a rural region: rural dynamics, rural economics and rural infrastructure.

Demand Estimation

(I) **Rural Dynamics: Total weight assigned = 7/10**

Rural Dynamics play a major role as they define the volume of transaction and kind of service mix. Hence, rural dynamics has been assigned the maximum weight. As the cost of service has to be kept low for rural areas, population is a major factor which indicates the volume and revenue generation.

(i) Population

Factor	Wt	Method for calculation				
1. Population Population within 5 km radius	5	Below 1000 0	1001-2000 0.3	2001-3001 1	3001-4000 2	4001-5000 4

(Source: Digital Media Outlook 2010,
Quoted in Mint, October 7, 2010. pp.12-13)

Historically, the Indian village population growth and density has been directly proportional to the economic prosperity. In Punjab and Haryana, where the land is fertile, the village population ranges from 3,000 to 10,000, while in poorer states like Bihar and Uttar Pradesh the population of a village is seldom above 2,000 people.

Since the services at the Kiosk are priced at a fraction of the opportunity cost, they are more or less affordable to every household irrespective of the income level. Since all the services which operate from the Kiosk are not compelling (like the e-Government applications), Drishtee Kiosk requires a larger customer base to have consistency in the income levels.

(ii) Literacy

2. Literacy	0.8	Literacy percent * 0.8

Though the services at the Kiosk are provided by the Kiosk Operator and there is a very slim chance of a direct interface of the villager with the Portal, literacy percentage has a reasonably significant impact on the viability of the Kiosk. Some services, like computer literacy, are more dependent on the sensitivity of the villagers towards education, but overall the weight is a shade less than 10 % and stands at 0.8.

(iii) Role of Government

3. Role of Govt.	0.6	No inclination	Officials inclined at dist	Computerisation at dist	Policy change for ICT at State	Delivery of ICT enabled service at Dist
Add whichever is applicable		0	0.1	0.1	0.2	0.2

Government services have the highest perceived value out of all the present service streams. This is presently the only service, after voice, which drives people to the Kiosk. It is not just a crowd puller but also positions the Kiosk very high in the minds of the villagers. But the reward is not without risk. Delivering any e-Government service through the Kiosk is a challenge. The quality of service or the commitment of the service provider to adhere to a timeline is questionable. Therefore, we have broken this sub parameter further into different indicators of the will of the Government to deliver its services electronically.

(iv) Entrepreneurship

4. Response of entrepreneur	0.4	Culturally govt job oriented	Negative towards self employment	Avg	Presence of ent community	Culturally entre-preneurial
Example: Gujarat is culturally entrepreneurial whereas Bihar is culturally Govt. job oriented		0	0	0.1	0.3	0.4

The diversity of our nation is not just exemplified by culture, history and language. There is the element of entrepreneurial diversity which gets noticed more often in the cities but is equally relevant in the rural areas. At the same time, there is the concept of hidden entrepreneurs which needs to be evaluated on the social platform. We have noticed that natural entrepreneurs in rural India have a history of discrimination which leads huge psychological barriers that have to be overcomed before they can become Kiosk operators. Needless to say, they come from low caste and class denominations. We take a huge effort through our initial promotions to motivate such people to come forward - as we know that they can value a kiosk the maximum and their motivation would help them tide over minor difficulties. But the problem is that such entrepreneurs are seldom bankable. The banks consider them loan unworthy because they do not have land or collateral to mortgage. Therefore, we suggest a higher weightage to regions which reflect more overt entrepreneurship.

(v) Role of Civil Society

5. Role of NGO	0.2	Not present	Not Active	Active	Very Active
		0	0	0.1	0.2

There is a definite logic for NGOs to operate in socially and economically deprived regions. With this argument, the level of activity of the NGOs should be inversely proportional to the profitability. But there is still a positive weight assigned, due to the critical role which NGOs play in spreading the word around. Most of them have deep rural roots and their inclination towards ICT gives a positive signal not just to the prospective operators but also to the village market as whole.

(II) Rural Economics: Total weight assigned = 1.5/10

Factor	Wt	Method for calculation
1. Population Above poverty Line	1.5	Percentage APL * 1.5

At the cost of displeasing the economists, we would like to simplify the weight division under this parameter into two broad heads based on one single factor, i.e. income. This is necessary because of lack of availability of micro economic data and because of the nature of transactions at the Kiosks. The Government services, for example, which form a sizeable component of the Kiosk revenues, are also segmented on the same economic division.

(III) Rural Infrastructure: Total weight assigned = 1.5/10

(i) Road Link

Factor	Wt	Method for calculation				
1. Road Link	0.4	Highway Link	Good Road	Average	Poor Road Link	No Proper Road
		0	0.1	0.2	0.3	0.4

To a commoner, the weight assigned to this parameter may seem unreasonable. After all, the rural infrastructure has been the focus of many political and social debates. Without doubt, this parameter plays a key role in the development of the rural areas. But when it comes to rural ICT business models, there is some anomaly.

Take for example, the nearest town and the quality of road link which plays an important role. A village which is nearer to the town with good road link has less potential whereas a village which is less reachable has higher demand for services.

(ii) Distance from Town

2. Distance from Town	0.4	Upto 10 KM	10 KM-20 KM	20 KM – 30 KM	Above 30 KM
		0.1	0.2	0.3	0.4

Similarly, it has been observed that the distance of a village from a town is directly proportional to the ICT Kiosk revenues. Though it might sound strange, but the above two factors indicate a negative correlation of Kiosk profitability to the rural infrastructure development. This perhaps is due to the nascent stage of growth of the ICT Kiosks in India. With time and with the help of 'Income' services, the offerings at the Kiosk would grow and move from 'Saving' services to 'Buying' services. This would definitely have an impact on infrastructural requirements.

(iii) Electricity

3. Electricity	0.3	No electricity	Electricity for 4 Hrs/Day	Electricity for 8 Hrs/Day	Electricity for 16 Hrs/Day	Electricity for 24 Hrs/Day
		0	0	0.1	0.2	0.3

The overall availability of electricity has a direct relation with the revenue factors. The Kiosk has to run for 6-8 hours (including the power backup) for it to make sizeable revenue. Though there are services which can be delivered without the use of Kiosk's ICT facilities, they have been found inconsistent in quality or relevance.

(iv) Natural Disasters

4. Constraints	0.2	Throughout the year	For three month in a year	Rarely
				0.2
Natural constraints like floods, if it is present for three months in a year.		0	0.1	

Recurrent floods and droughts can play havoc with a Kiosk's seasonal viability. But as most of the services are essential for livelihood, the Kiosk operators can make up for losses in 'good' months.

(v) Telecom

5. Telephone	0.2	Multi hop copper line exists (poor data transfer)	Higher speed connection exists
		0.1	0.2

The availability of a data connection is a pre-requisite for the setup of a Drishtee Kiosk. Therefore, the focus is on the data transfer speed. We have found out that Internet connectivity on a multi-hop copper line is not possible. This results in a local Intranet functioning which in turn limits the number of services which can be delivered through the Kiosk.

Service Overview

Service Description

A service for an ICT kiosk is a product, service or information which can be delivered completely or partially using ICT. Some services like e-mail, Net telephony, and entertainment can be delivered completely using ICT whereas in case of services like e-commerce, the information regarding products and its order can flow electronically but the delivery of product has to be physical. There has to be a bouquet of services through these Kiosks to make them sustainable. Only information-based services are not a viable business source for an entrepreneur based kiosks.

The need and demand for services varies from district to district. It is very important to understand the needs of the villagers before launching the services. Drishtee conducts Need Assessment Survey before entering a district. The survey results in the type of service and level of customisation required for the kiosk in that particular district.

Type of Services

(i) **Income:** This is the type of service which can generate revenue not only for the kiosk owner but also for the villagers. These services either create new income sources for the villager or create a demand outside for the existing products of the village. These services will increase the per capita income of the villager and will ultimately lead to better socio-economic status. Some of the services which fall under this category are low end Business Process Outsourcing (BPO), and Rural to Urban e-commerce.

(ii) **Saving:** These are the services which can create a net saving for the villager by availing them through the kiosks. The saving component comes either by making the service available near the villager which used to be available at a distant place, like the district headquarter or reducing the inefficiency in the existing service delivery system. Sample services in this type are e-governance, B2C e-commerce, and digital photography.

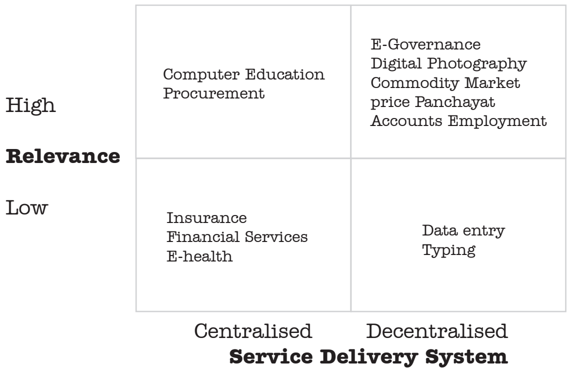
(iii) **Buying:** These are the services which are normally not used by the villagers. These services should be launched only after successful launching of at least one of the above two category of services. Once the villager has disposal income from above two categories of services then s/he can invest in this category of service. The services here include insurance and entertainment.

Service Development Process (SDP)

Drishtee follows a multilayer service identification and deployment process. The elements of Service Development Process are as follows:

Identification

Drishtee follows two different processes for identification of services: bottom-up (identified at the grassroots level by the villagers and the kiosk operator; they get easily accepted by the villagers) and top-down (which require training of kiosk operator and promotion).



Service Mapping

Based on its relevance and service delivery system, the service is plotted on the matrix.

Viability test

This is done by determining the value that the service can generate across the network and at the Kiosk.

Scalability

Viability of the service in geographical location. If the service can be implemented all across India then the scalability of the service is taken as 100.

Number of transactions

The number of transactions is determined by the proportion of the target population that would be availing the service and the number of times they will be using the service in a year i.e.Target population * Periodicity.

Value of the service gives the revenue that the service can generate for the entire network whereas the product of the last two factors (i.e. Number of Transactions and Unit Value) gives the value for the kiosk operator.

Alliance

Once the value for the service works out to be positive then the next process is to identify and analyse potential service partners for the service. The factors which are taken into consideration while evaluating a service partner are rural orientation of the organisation, and flexibility of the service to be customised for the rural market.

Delivery System Design

In this phase the process for delivery of service is mapped. At this stage the cost of service is determined.

Pilot Test

The service once ready for deployment is first tested at the model kiosks at various locations. This is done to test the process and acceptability of the survey. Based on effects of various factors influencing the service the promotion and sales strategy is developed.

Service Segmentation and Revenue Potential for a kiosk

The services that can be offered through an ICT center can be broadly divided into ten categories:

1. eGovernment Services

Most of the government services like caste certificate, domicile certificate, copy of land record, or license required by a villager can be availed at the district headquarter tehsil or block office and the government is the only provider of these services. The villager by availing these services at the kiosk saves on transportation and opportunity cost loss due to a days trip to the district headquarter. This also builds trust for the kiosk among the villagers as it is perceived to be an extension of government. Although e-government services do not yield very high revenue for the kiosk owner, they attract villagers to the kiosk.

2. Education

As the kiosk owner is trained by Drishtee on computer fundamentals and various other applications like word processor, and spreadsheet, the kiosk acts as a computer training center for the panchayat. In most of the panchayats, the kiosk computer is the first computer in the village and there is lot of inquisitiveness among the villager to learn computer. The Kiosk can also act as e-learning center for imparting soft skills and vocational training. The faculty at a centralised location can teach students at multiple kiosks simultaneously using multi-casting.

3. Business Process Outsourcing (BPO)

The kiosk acts as a low end BPO center. Government data entries like Below Poverty Line data entry, and pension scheme data entry are being extended to the kiosk. The kiosk owner with the computer and DTP trained youth of the village enters these data during the off peak hour of the kiosk and during the night. Other BPO work taken up at the kiosk level is vernacular typing.

4. Health

Specialised doctors do not travel to villages and telemedicine at kiosks is not feasible. Villagers either spend a lot in travelling to city for treatment of minor ailments or end up paying to village quacks and not recovering. Basic consultation with doctors by sharing information and picture and fixing appointment with specialised doctor are some services which have been successfully deployed at kiosks.

5. E-Commerce

There is a multitude of products in the Indian villages, some of them very unique, especially the handicrafts made by rural artisans. Despite having worldwide acceptance and appreciation for their skills, Indian craftsmen have always been undervalued due to the improper marketing and promotion of their products. Many a times the user of the product does not know the place of origin, of the product being used by him. Rural to urban e-commerce through the kiosk establishes a direct communication link between the buyer and the artisans. It also enables the buyer to specify the exact design or quality of product he/she is looking for.

6. Desktop Publishing (DTP)

In most cases, the kiosk being the only computer in the panchayat gets all typing jobs of the villages. Printing of agreements is another service the kiosk provides as they have all standard agreement formats stored in their computer. The kiosk equipped with digital camera and a photo printer acts as a digital photo studio for the village.

In most cases, the kiosk being the only computer in the panchayat gets all typing jobs of the villages. Printing of agreements is another service the kiosk provides as they have all standard agreement formats stored in their computer. The kiosk equipped with digital camera and a photo printer acts as a digital photo studio for the village.

7. Commercial Services

Kiosks offer a channel to reach the villagers for corporates who have interest in rural India. Services like insurance and financing can be delivered through the kiosk to the villagers.

8. Agriculture

Villages in India are predominantly agri-economy based. Agriculture related services play an important role here. Agri-advisory services, commodity market price, information and reference about agri inputs are the services that the farmers avail at the kiosk.

9. Communication

Communication services at a kiosk mostly depends on the migrating population of the village. If people have migrate outside India then their family and relatives in the village use the kiosk to communicate with them via e-mail and Net telephony.

10. Entertainment

Due to lack of movie theaters and cable TV connectivity and free time in the evening after daylong farming, there is a huge demand for cable TV in the villages. Movie shows at kiosks and cable TV to home are services that the villagers are ready to buy.

Connectivity Vs. Services

Connectivity plays a major role towards viability of an ICT kiosk, although some of the services like basic computer DTP and some physical e-government service require no connectivity.

Also being a yet-to-catch-up idea, the government is usually not in a position to take risks. An administration, however, is open to the idea of providing the required support for helping a firm establish such a network. This support usually comes in the form of allowing access to the database and state records and helping the firm re-engineer the service flow.

The establishment of a kiosk network without any financial investment from the government has become Drishtee's USP. This has helped the firm expand to other districts, irrespective of the nature of IT policy at the state level, something beyond its control. Drishtee is thus giving birth to an entire generation of IT-savvy entrepreneurs in rural India.

There can be no better way to spread the use of IT than by creating micro-enterprises around the technology. The eagerness to earn, supported by the need to learn has led to what Drishtee can truly boast of – its kiosk network.

Resources

Bhatnagar S and R. Sechware (Eds.): Information and Communication Technologies in Development: Cases from India, New Delhi: Sage. 2000.

Pringle I and S. Subramanian (Eds.): Projects and Experiences in ICT Innovation for Poverty Reduction, New Delhi: UNESCO. 2004.

Parayil G (Ed.): Political Economy and Information Capitalism in India: Digital Divide, Development Divide and Equity, Basingstoke: Palgrave Macmillan. 2006.

Business World (2010): The Marketing White Book – 2009-2010.

Satyan Mishra, managing director and co-founder of Drishtee, is passionate about creating an ecosystem for the rural and other marginalised communities for facilitating organic growth and overall development. His concept reflects in Drishtee operations in more than 10 states of India where the focus is on improving community access to services and products via a large network of thousands of micro-entrepreneurs. Services like education, health, and finance have been Drishtee's key focus areas. Satyan, an MBA in International Business from Delhi School of Economics, now has 11 years of entrepreneurial experience. Satyan comes from Bihar and is dedicated to his work and passion. He was nominated as ZDNet Asia's Technopreneur of the Year later in 2006 and presently is a member of international forums like the Clinton Global Initiative and has been an Ashoka fellow since 2004.

Nitin Gachhayat graduated with Chemistry honors and then later did his MBA at FORE School of Management, Delhi. He started his career with a couple of consulting firms in Delhi. As a social entrepreneur, he co-founded Drishtee (www.drishtee.com) with Satyan Mishra and Shailesh Thakur, for whom he leads the technological integration front efficient service delivery to rural communities. He also specialises in segments of legal and statutory, franchisee policy and development and monitoring systems management. Nitin also led the team working with a focus on 'developing services that work for poor.' During his work in the segment, Nitin has been recognised as a Young Leader by Asia Society for the year 2010.

Part V
Looking Ahead

Chapter 25

Pavan Duggal

A Decade Of Cyberlaw In India

Some Observations

Editor's Note

This chapter traces the growth of cyber and e-commerce laws in India, starting with the Information Technology Act, 2000, which made email a valid and legal form of communication in our country, authorised the usage of digital signatures, and recognised corporate electronic records. But there were certain loopholes and grey areas when addressing copyright and jurisdiction. The prime example being the 26/11 Mumbai attacks, exemplifying how cyber terrorism can become a major challenge. The Information Technology (Amendment) Act, 2008, which was implemented in 2009, expanded the domain to all kinds of communication devices including mobile phones. There is still room for improvement in areas like spam legislation, privacy, and punishment for violators. To overcome this, emerging frontiers such as the Unique Identification Number, and legal support have been included for its usage.

The Internet was commercially introduced in India on August 15, 1995. Since then, we have seen rapid adoption of the internet in different sectors in India. After almost one and a half decades of its commercial introduction, this online medium has had a significant impact. However, despite some successes, the kind of exponential penetration that was expected of internet in India has not yet been achieved.

The user base and usage of internet has grown in India, and today the internet is being adopted by an ever increasing number of corporate, industrial, governmental and commercial establishments. The onset of internet has provided a tremendous fillip to the growth of electronic commerce and electronic governance in India. A large number of electronic commerce and electronic governance projects have been initiated in the last decade, which has begun to impact the growth of Indian economy.

While a lot of technical and other developments have accompanied internet growth in India, there have also been developments in jurisprudence around the law impacting the use of internet as also computers, computer systems, computer networks, computer resources and communication devices. I now propose to examine some of the significant developments of jurisprudence with regard to internet law in India and their impact.

Evolution of Cyber Law in India: A Timeline

In India, when the Internet was commercially introduced, no necessity was felt for having in place an appropriate and enabling legal regime. It may be pointed out that the State of Utah became the first state in the world to enact a Cyberlaw. Meanwhile, the General Assembly of the United Nations adopted the United Nations Commission on International Trade Law's (UNCITRAL) Model Law on Electronic Commerce on January 30, 1997. It must, however, be noted that the UNCITRAL Model Law provides only the basic framework on which the nations can build up their domestic laws relating to electronic commerce. It is not a comprehensive code.

Inspired by the UNCITRAL law on e-commerce, the Government of India decided to enact a law that would make e-contracts legal, electronic records admissible in convenience, and which would make cosmetic changes to some other existing laws. Consequently, three key areas were identified - Contract, Indian Penal Code and Evidence. Since a large number of matters fell under the Concurrent list and all of them did not apply to Jammu and Kashmir, the government had to invoke a special power under Article 253 of the Constitution of India to the Parliament to make a law for India on the model of UNCITRAL Law.

On 17th May 2000, Parliament created history when it passed India's first Cyberlaw aimed at regulating cyberspace, namely, the Information Technology Act, 2000 (IT Act, 2000). It received the President's assent on June 9, and was implemented on October 17, 2000.

The Information Technology Act, 2000

The Information Technology Act, 2000 is the first amongst a series of cyber legislations which India will require to effectively become a major power in cyberspace. It provides for a legal infrastructure aimed at promoting e-commerce in India. It has now become the law of the land in India. The object of The Information Technology Act, 2000, as defined therein is as under:

> *"to provide legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as "electronic commerce", which involve the use of alternatives to paper-based methods of communication and storage of information, to facilitate electronic filing of documents with the Government agencies and fur-*

ther to amend the Indian Penal Code, the Indian Evidence Act, 1872, the Banker's Book Evidence Act,1891 and the Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto."

Towards that end, the said Act thereafter stipulates numerous provisions. The Act aims to provide for the legal framework so that legal sanctity is accorded to all electronic records and other activities carried out by electronic means. The said Act, further, states that unless otherwise agreed, an acceptance of contract may be expressed by electronic means of communication and the same shall have legal validity and enforceability. It alsopurports to facilitate electronic intercourse in trade and commerce, eliminate barriers and obstacles coming in the way of electronic commerce, resulting from the glorious uncertainties relating to writing and signature requirements over the Internet. The Act also aims to fulfill its objectives of promoting and developing the legal and business infrastructure necessary to implement electronic commerce.

Chapter II further states that any person by the use of a public key of the subscriber can verify an electronic record. Chapter III of the Act details Electronic Governance and provides inter alia amongst others that where any law provides that information or any other matter shall be in writing or in the typewritten or printed form, then, notwithstanding anything contained in such law, the said requirement shall be deemed to be satisfied if such information is made available in the electronic format.

Chapter IV gives a scheme for regulation of Certifying Authorities . The Act envisages a Controller of Certifying Authorities who shall perform the function of exercising supervision over the activities of the Certifying Authorities as also laying down standards and conditions governing the Certifying Authorities and specifying the various forms and content of Digital Signature Certificates. Chapter X envisages that the Cyber Appellate Tribunal shall be an appellate body, where appeals against the orders passed by the Adjudicating Officers shall be preferred.

The Indian Cyberlaw has, further, highlighted various offences/cybercrimes. These offences include tampering with computer source documents, hacking, publishing of information which is obscene in electronic form, breach of confidentiality and privacy, misrepresentation, publishing Digital Signature Certificate falsely in certain particulars and publication for fraudulent purposes.

Strengths of IT Act, 2000

From the perspective of the relevant stakeholders in the electronic ecosystem, the IT Act 2000 and its provisions contained various positive aspects:

(A) Email became a valid and legal form of communication in our country, which can be duly produced and approved in a court of law. Even intra company notes and memos, till now used only for official purposes, also came within the ambit of the IT Act and will be admissible as evidence in a court of law.
(B) Companies were able to carry out electronic commerce using the legal infrastructure provided by the Act.
(C) Digital signatures were used more frequently to carry out transactions online. These digital signatures have been given legal validity and sanction in the Act.
(D) The Act also enabled companies to file any form, application or any other document with any office, authority, body or agency owned or controlled by the appropriate Government by means of such electronic forms, as may be prescribed by the appropriate Government.

(E) Corporates are mandated by different laws of the country to keep and retain valuable and corporate information. The IT Act enables companies to legally retain the said information in the electronic form, if:

(a) the information contained therein remains accessible so as to be usable for a subse quent reference;
(b) the electronic record is retained in the format in which it was originally generated, sent or received or in a format which can be demonstrated to represent accurately the information originally generated, sent or received;
(c) the details which will facilitate the identification of the origin, destination, date and time of dispatch or receipt of such electronic record are available in the electronic record.

(G) The IT Act also addressed the important issues of security which are so critical to the success of electronic transactions.

The Information Technology Act, 2000 provided for civil and criminal liability for any person whose computers, computer systems and computer networks were accessed in an unauthorised manner.

Limitations of IT Act, 2000

The Indian Cyberlaw had various drawbacks and loopholes. It may be pertinent to mention that the said Act purports to be applicable to not only the whole of India but also to any offence or contravention there under, committed outside of India by any person. The enforcement aspect of the IT Act is an area of grave concern. The IT Act, 2000 did not touch at all the issues relating to domain names. Even domain names were not defined and the rights and liabilities of domain name owners did not find any mention in the said law. The IT Act, 2000 also did not deal at all with the Intellectual Property Rights of domain name owners.

Contentious yet very important issues concerning Copyright, Trademark and Patent were left untouched in the said law, thereby leaving many loopholes in it. Another major grey area was that draconian powers were given to a police officer not below rank of the Deputy Superintendent of Police under Section 80 of the Act regarding entry, search and arrest regarding the investigation of cybercrimes. The Indian Cyberlaw further did not lay down parameters for its implementation.

Information Technology (Amendment) Act 2008

The grey areas of the Information Technology Act, 2000 were so wide that the Government of India felt the necessity of it. Consequently, the Central Government tabled the Information Technology (Amendment) Bill, 2006 before the Indian Parliament. The Indian Parliament referred the same to the Parliamentary Standing Committee on Information Technology. The said Standing Committee gave its recommendations in the second half of 2007 to the Government.

Thereafter, the government was seized of the said recommendations. Meanwhile, the 26/11 Mumbai attacks demonstrated in clear terms that 'cyber terrorism' is one of the biggest challenges facing India today. The Indian Government and the Parliament moved in a quick manner and passed the Information Technology (Amendment) Act 2008. The Information Technology (Amendment) Act, 2008 received the assent of the President on February 5, 2009 and were finally implemented on October 27, 2009.The new amendments sought to remove procedural difficulties in the implementation of the law, make the legislation technology neutral, sought to incorporate the concept of electronic signatures and further added, various new cybercrimes in the Information Technology Act, 2000.

One of the biggest and most significant contributions of Information Technology (Amendment) Act, 2008 was that it broadened extensively the ambit of applicability of the Information Technology Act, 2000. It may be pointed out that prior to October 27 2009, the Information Technology Act, 2000 was only limited in its application to computers, computer systems and computer networks. However, with effect from October 27, 2009, it also became applicable to all kinds of computer resources and communication devices. The word "communication device" has been defined by the law to refer to all kinds of cell phones, personal digital assistants, or combinations of both or any other device used to communicate, send or transmit any text, video, audio or image. Thus, all kinds of cell phones, blackberries and personal digital assistants have been brought within the ambit of Indian Cyberlaw.

Various kinds of mobile crimes have been sought to be covered within the amended Indian Cyberlaw. Misuse of mobile phones for the purposes of causing annoyance, inconvenience, danger, obstruction, insult, injury, criminal intimidation, enmity, hatred or ill will has been brought within the ambit of criminal penalty. Further, if any person sends, by means of a communication device, any information that is grossly offensive or has a menacing character, commits an offence punishable with three years imprisonment and fine. Identity theft has been specifically brought within the ambit of penalty. Thus, any identity theft, committed by means of any computer resource or any communication device, would still qualify to be an offence under the Indian Cyberlaw and would be punishable with imprisonment of either description for a term which may extend to 3 years and shall also be liable to fine which may extend to Rs. 1 lakh.

The offence of cyber terrorism has been introduced for the first time in the history of independent India in the form of the amendment to the Information Technology Act, 2000. India, for the last few years, has been seeing the tremendous increase in the amount of activities that are tantamount to terrorism. Furthermore, the advent of the internet and new tools -- including tools for encryption, data masking, proxy server hopping and other related activities -- have opened up new avenues for terrorists as well to use the internet.

This author himself testified before the Parliamentary Standing Committee of the Indian Parliament and underlined and stressed the need for incorporating cyber terrorism as an offence under the amendments to the Information Technology Act, 2000. The catalyst in this direction happened to be the 26/11 Mumbai attacks. The Mumbai attacks left no doubt in anybody's mind that cyber terrorism was here to stay and unless the same is handled by a strong hand, it is likely to go out of control and impact India prejudicially as time passes by. Therefore, the new offence of cyber terrorism was incorporated under the amended Information Technology Act, 2000.

This provision is incorporated under Section 66F of the amended Information Technology Act, 2000. A perusal of the entire section clearly shows that it is talking about computer resources as also data, information and computer databases.

A study of the definition of the term "computer resources" would clearly show that this is vast enough to include any kind of high-speed data processing device or system which performs logical, arithmetic and memory functions, by manipulations of electric, magnetic or optical impulses and includes all input, output, processing, storage, computer software or communication facilities which are connected or related to a computer in a computer system or computer network. The said definition is so vast so as to specifically include all communication devices as well.

A broad analysis of the offence of cyber terrorism defined under Section 66F(1) shows that it is broadly classified into two major categories of activities. The first thing that strikes any person about the definition is the huge, comprehensive and extremely wide ambit, scope, applicability and nature as also character of the offence of cyber terrorism. There has to be an intention to threaten the unity, integrity, security or sovereignty of India or to strike terror in the people or any section of the people.

The second essential ingredient is that there must be a cogent act of either denying or causing the denial of access to any person authorized to access the computer resource or attempting to penetrate or access a computer resource without authorization or exceeding unauthorised access, or introducing or causing to be introduced any computer contaminant.

The third essential element is that the aforesaid intention and acts must either cause or are likely to cause death or injuries to persons. Thus, a perusal of the said section would show that this is possibly the widest possible characterization of the offence of cyber terrorism.

The said offence is indeed very broad and includes not just people who directly use computers, computer resources, data and information as also computer databases in the electronic form to cause detriment to the cause of the sovereignty and integrity of India, but also all those people who assist such people in their various illegal activities aimed to strike terror in the hearts of people at large.

As per Section 66F(2), it is been categorically provided that whoever commits or conspires to commit cyber terrorism shall be punishable with imprisonment, which may extend to imprisonment for life.

Further, because of the application of Section 81 of the amended Information Technology Act, 2000, the provisions of Section 66F related to cyber terrorism shall prevail notwithstanding anything contrary contained therewith in any other law for the time being in force. The Information Technology Act, 2000 being a special legislation, its provisions pertaining to cyber terrorism prevail over anything inconsistent therewith in any other law including the existing anti-terror laws of India.

The Indian law also has prescribed for the duties and responsibilities of intermediaries including Telecom Service Providers, Network Service Providers, Internet Service Providers, Web Hosting Service Providers, Search Engines, Online Payment Sites, Online Auction Sites, Online Marketplaces and Cyber Cafes. The law has mandated a responsibility of exercise of due diligence while discharging their obligations under the Information Technology Act, 2000 on behalf of such intermediaries and if they fulfill the parameters of Section 79 of the amended Information Technology Act 2000, then they escape liability for any kind of third party information, data or communication link made available or hosted by them.

Also notable is the fact that the Indian Cyberlaw has recognized the significance that cyber security occupies in today's context. As such, cyber security has also been made a focal point in the Information Technology Act Amendments. The lawmakers and the Government have to be complemented for their appreciable work removing various deficiencies in the Indian Cyberlaw and making it technologically neutral, yet it appears that there has been a major mismatch between the expectation of the nation and the resultant effect of the amended legislation, more so on corporate India.

Analyzing Information Technology Act Amendments

A careful analysis of the said amendments, clearly bring home the point that the new amendments are not at all sufficient in the context of emergent needs of corporate India and have various glaring loopholes. The issues relating to confidential information and data of corporate and their adequate protection have not been adequately addressed. The said law is not a comprehensive law on data protection or on digital secrets. Having a couple of sections on data protection does not serve the requirements of corporate India.

India has learnt neither from the wisdom of the United States nor the European Union in terms of their respective experiences in the area of data protection. The proposed provisions will not aid the victim entities whose data and information are often misused by their employees or agents with impunity.

The IT Act Amendments are also deficient in the sense that they do not create rebuttable presumptions of confidentiality of trade-secrets and information, in the context of corporate India. A large number of Indian companies and individuals are saving their confidential data, information and trade secrets in electronic form on their computers. Given the apparent increase in technology adoption, it is increasingly being found that that despite all precautions being taken, some employees are still going ahead and taking away confidential data from companies. The inability of the law to create enabling presumptions of confidentiality regarding corporate and individual data and information in the electronic form is likely to complicate matters further for Indian companies and netizens.

Absence of an effective remedy for corporate, by the new amendments is likely to further erode the confidence of the industry in the new cyber legal regime. The maximum damage by way of compensation stipulated by the new cyberlaw amendments is Rs 5 crore. When calculated in US dollar terms, this is a small figure and hardly provides any effective relief to corporates, whose confidential information worth crores is stolen or misused by employees or agents.

Further, the word ‘spam’ is not even mentioned anywhere in the IT Amendment Bill passed by both the houses of the Parliament. India has missed yet another opportunity to deal with the contentious issues of spam. It is pertinent to note that countries like USA, Australia and New Zealand have demonstrated their intentions to fight against spam by coming up with dedicated anti-spam legislations. However, in India, we neither have any anti-spam legislation, nor do we have any specific provisions for effective prevention and regulation of spam.

Despite more than one decade of working on the Indian Cyberlaw, it is clear that data protection has not been accorded its due recognition, as it ought to have been done. India needs to take a leaf from the experience of various other nations in this regard. Further, the concept of privacy in India needs to be substantially enhanced and further developed. The law passed has used very basic concepts of personal privacy. These need to be further well developed to incorporate therein issues pertaining to personal as well as data privacy.

There has been a remarkable short sightedness of the Indian IT Act Amendments to address the complicated emerging issues pertaining to electronic discovery. The IT Act amendments do not address jurisdictional issues, as well. At a time when the Internet has made geography history, it was expected that the new amendments would throw far more clarity on complicated issues pertaining to jurisdiction. This is because numerous activities on the Internet take place in different jurisdictions and there is a need for enabling the Indian authorities to assume enabling jurisdiction over data and information impacting India, in a more comprehensive way than in the manner as sketchily provided under the current law.

The new amendments make it mandatory for corporate, possessing, dealing or handling any sensitive personal data or information in a computer resource to maintain “reasonable security practices, and procedures.” However, what would be these “reasonable security practices and procedures” would be is anybody’s guess. It has to be pointed out that one set of security practices will not fit the entire nation. What would be reasonable security practices for one industry may not be directly applicable to another industry. The most startling aspect of the new amendments is that these amendments seek to make the Indian Cyberlaw, a cyber crime friendly legislation; -- a legislation that goes extremely soft on cyber criminals; a legislation that chooses to encourage cyber criminals by lessening the quantum of punishment accorded to them under the existing law.

However, what amazes the lay reader is that the amendments to the IT Act have gone ahead and reduced the quantum of punishment. Taking a classical case of the offence of online obscenity, Section 67 has reduced the quantum of punishment on first conviction for publishing, transmitting or causing to be published any information in the electronic form, which is lascivious, from the existing five years to three years. Similarly, the quantum of punishment for the offence of failure to comply with the directions of the Controller of Certifying Authorities is reduced from three years to two years.

Further, it is shocking to find that the specific offence of hacking, as defined under Section 66 of the existing Information Technology Act 2000 has been completely deleted from the law book. In fact, the existing language of Section 66 has now been substituted by new language. Deleting hacking as a specific defined offence does not appeal to any logic. The cutting of certain elements of the offence of hacking under the existing Section 66 and putting the same under Section 43 makes no legal or pragmatic sense. This is all the more so as no person would normally diminish the value and utility of any information residing in a computer resource or affect the same injuriously by any means, with the permission of the owner or any such person who is in charge of the computer, computer system or computer network.

At a time when the entire world is going hammer and tongs against Cyber Crimes and Cyber Criminals, here comes a contrary trend from the Indian legislature. Cyber criminals of the world targeting India or operating in India need not despair. With the coming into effect of the new amendments, India is likely to see a drought of cyber crime convictions.

Another major change included in the new amendments is that cyber crimes in India shall now be investigated not by a Deputy Superintendent of Police, as under the earlier law, but by a low-level police inspector. So, henceforth, the local police inspector is going to be the next point of contact, the moment a person or any company is a victim of any cyber crime. The efficacy of such an approach is hardly likely to withstand the test of time. Given this new development, it is probable that the concept of e-hafta (or electronic hafta) is likely to be reinforced and developed as an institutional practice.

The entire issue relating to encryption as a process has not been satisfactorily dealt with. Encryption is a process that scrambles information, such that it cannot easily be understood by people who do not have the right key to unscramble it. The level of security this provides depends critically on the length of the keys used in the encryption and decryption process. Rather than addressing the complicated issues of encryption and defining a comprehensive policy on encryption, the new amendments have merely decided to defer the said issue and leave it to the route of secondary legislation by means of rules and regulations. This makes the situation all the more complicated.

There is a need for coming up with an appropriate, secondary legislation with regard to practices and procedures to be followed in the context of cyber terrorism. The author personally believes that the sovereignty and integrity of India is paramount and no forces or terrorist groups can ever be allowed to subvert the sovereignty and integrity of India or the security of the state, friendly relations with other nations, public order, decency or morality.

All in all, given the glaring loopholes as detailed above, the new IT Act Amendments are likely to adversely impact corporate India and all users of computers, computer systems and computer networks, as also data and information in the electronic form.

Seen from the perspective of the growth of case law, large advances have happened in the growth of jurisprudence pertaining to cyberlaw in India. In the last one and a half decade, we have seen emergence of various important and significant case laws which impact the growth of cyberlaw in India. The Indian judiciary has been particularly proactive in this regard. In the number of cases, the Delhi High Court has issued landmark orders to identify anonymous online users who engage in illegal or criminal activities. Numerous cases pertaining to the liability of network service providers and intermediaries have also hogged the limelight.

Conclusion

Thus, when one looks at the holistic perspective, one finds there have been substantial developments and advancements in Indian Cyberlaw. These advancements are aimed to assist the growth of electronic format as also digital industries in India. However, while large areas have still been covered, law is a process of constant evolution. In this regard, it can easily be stated that there are needs for further amending the Indian Cyberlaw keeping in mind the fact that many issues have still not been addressed.

At the time of writing, the Government of India has already introduced the Unique Identification Number under the aegis of the Unique Identification Authority of India. These Unique Identification Numbers, being data and information in the electronic form generated by computer resources, are directly impacted by the Information Technology Act, 2000. However a new appropriate legislation needs to be carved out in this regard so as to further enabling legal support for the growth of Unique Identification Numbers in India.

In conclusion, it can be stated that substantial growth is taking place in the evolution of jurisprudence of Indian Cyberlaw. However, major substantial advancements need to be done so as to make Indian Cyberlaw one of the best cyber legislations of the world. We hope that this evolution process will keep on continuing and the Indian legislature will keep on further improving upon the said legislation and amending it, so as to meet the aspirations, needs and expectations of the relevant stakeholders in the digital economy. It will, thus, be interesting to see how the future unfolds with regard to the growth of Indian Cyberlaw.

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Chapter 26

Sunny Ghosh and Sanjukt K. Saha

The New Iron Ore & The Roar of the Cloud

How early stage Innovation and the Internet is changing the nature of dreams in India!

Editor's Note

This chapter argues that the Internet is a key player in uncorking innovation, the new "iron ore" of India's future. 700 million Indians now drive consumer spending close to US$ 100 billion a year with a current growth rate of 8.5 per cent - but 390 million Indians still live on less than US$ 1 a day. The need of the hour for India is emergence of more capital support systems and entrepreneurial incubation centres. A new range of innovators are moving into hardware and product space, such as Notion Ink and its ADAM tablet, an iPad competitor. Innovators are creating new frameworks beyond the *Jugaad* model. Even some Bollywood movies are reflecting this new attitude and spirit among Indian youth. The Web of 2000 is very unlike the Web 2.0 that we see today. Cloud computing will not just provide productivity savings for existing organisations but create a new crop of Internet entrepreneurs, including social business innovators. Broadband Internet links now represent the new waterways of India

No other story epitomises the entirety of the Indian march in the past decade as the frenzied run of its iron ore. At the turn of the millennium, India exported ore worth a measly US$ 80 million. As a nation it continued right through, steadily exporting another grey matter – draining out its best brains to the rest of the world for the lack of opportunities within and the availability outside. But that popular aspect of India's development pales in comparison to the story of its iron ore. By 2009, the sleeping elephant was exporting US$ 5 billion worth of this precious grey resource – an amazing sixty fold increase in just under a decade.

This story is as disrupting as that of the growth of this extraordinary country. In 2001, India was already being spoken of as the fourth largest economy. However, given that this was on its purchase power parity, at best, the plaudit was a meek acknowledgement. With a GDP of US$ 477.4 billion, the country was behind the world by large measures. At the end of 2009, however, reaching a GDP (Gross Domestic Product) of US$ 1.25 trillion, India was no more an exotic nation of snakes and Bangalore, patronized as a rapidly emerging country due to its attractive markets, but an equal partner to international business and the polity of nations. This growth required steel; a requirement that was fed by the rapid increase in the production of its iron ore. By 2005, with ore to spare, India accounted for a quarter of the entire Chinese iron ore import, feeding that country's parallel gluttony for construction.

The moment was quite a highpoint in the history of India's modern development, not so much noticed in the flurry of other glamourous happenings. At no other time, had India been in a position of such explosive growth. For a country that, for most of the 20th century, restricted its citizens to an allowance restriction of US$ 8 per day while traveling abroad, to conserve its foreign currency holdings, it was beyond imagination to be in a position to fuel its own growth and on top of that, fuel a fourth of the growth of a roaring tiger. India really arrived at this moment. The elephant was awake and no longer rubbing its eyes.

By 2009, India's share of Chinese ore imports suddenly dropped to 17 per cent. There were new kids on the block of global development. India was losing rapidly to Brazil and South Africa. At the same time, India's total exports to China increased by 57 per cent. The formula of growth was simple - Develop locally, Export globally. The variables were not. Competition necessitates the sustained discovery of new resources for play in international markets. The magic here is to find resources that can oulast the competition. China went on beyond South Africa to the rest of the Dark Continent in search of ore. While India plays catch up, it needs new iron ore.

New Iron Ore, New Miners

As a country, India ranks 58th on the International Innovation Ranking report of the Economist Intelligence Unit. Over 92 per cent of its workforce belongs to the unorganized sector. Our infrastructure is indeed bad. We have tens of thousands of miles of pristine world class highways and hundreds of thousands of subsidiary roads filled with potholes, feeding onto them. Over 588 districts, out of 626, are affected varyingly by an insurgency that is a throwback to the seventies. Invisibly, 390 million people in the country live on below US$ 1 a day. These numbers do not really help a nation score high on an international index, though it may score editorials with ego driving images of large and powerful husbandry.

None of these, however, seem to account for the fact that more than 700 million Indians now drive consumer spending close to US$ 100 billion a year and a current growth rate of 8.5 per cent is projected to overtake China by 2013.

What is therefore India's new iron ore? It has been right there hidden under the soil for centuries, waiting for brave new miners to unleash its constraints. The country has been for centuries a land of small shopkeepers. Just like the hundreds of thousands of its engineers draining out for opportunities elsewhere, making do with US$ 8 a day until they had a footing in promised lands, the Indian shopkeeper made do with whatever this land could offer him. With not many steady jobs to go around, he ran a small business, he sold, he traded, and even pinched pennies to save for the rainy day. The act of entrepreneurship was a race for survival in towns, cities and villages that were frontier land for decades after independence. He was fighting to survive but also biding his time.

In 2009, while commerce and export administrators were brainstorming frantically to plug the fall in iron ore exports and compete with the BRIC countries, a young 22 year old graduate of the Indian Institute of Technology (IIT) founded a company with an interesting, cocky product – the ADAM. This was different, the name the least - Notion Ink, Rohan Shravan's company, was not only taking the battle of handheld computing right to its global prima donna – Apple – but also doing it differently. The ADAM is an iPAD competitor and as curvy as a tablet PC can be. But this was not a Chinese copy. This was not a US$ 100 clone with dummy navigation buttons. This is a device with a vision that has every element to stay relevant in the unfolding handheld wars of the future.

The ADAM has a 16:9 aspect display, the iPAD emphatically at 4:3 - Rohan believes that when you're using a tablet like the ADAM in portrait mode instead of in landscape, it's easier to fit a text column comfortably on a widescreen display at 16:9 aspect ratio. A brave and a confident call had its critics. All of them toned down their analyses when RIM, the high innovation makers of the BlackBerry came out with a 16:9 aspect Playbook, its own take on the wars. The ADAM has many such brave calls. Among the others, the most important perhaps is the one to use traditional 3 cell batteries rather than proprietary ones like in the iPAD – important because that was taking into account how open source and standards will increasingly drive hardware too in the future, Apple or no Apple. The ADAM story is representative of the new Indian shopkeeper. He raises capital. He builds products, taking the fight right into the home bases of well entrenched global players. He makes calls on the future that are confident, brave, original and in sync with the open source attitude that is driving innovation and entrepreneurship around the world.

The drive to change has traditionally been met with stiff opposition in India though the necessity always existed. Whether in the area of universal education or social development, in healthcare or just in the adoption of new business models - for generations we have remained crippled due to the lack of capital, access to sophisticated technology and early customer markets. Any adverse context such as this breeds great ideas and innovation and India is no exception. When farmers in Punjab needed a cheaper vehicle for transport - they simply mount a diesel irrigational pump on a steel frame with wheels, creating a new kind of vehicle they call *jugaad*.

India's new iron ore is innovation. It has been frothing quietly waiting to bubble over the layers of anticipation that built up over the centuries. Waiting for and a miner to dig it out. The new miners are people like Rohan. All they need to do is look for prospects in their own backyard.

Backyards, Bollywood and a Billion Idiots

Is Rohan representative of the Indian milieu? The Indian Institutes of Technology supplied the brains for the drain starting in the Seventies. By 2001, many of these graduates, after spending years outside the country, started returning home by the thousands to, work in increasingly large and complex businesses, as well as to start new ventures for everything the new consumers would accomodate. This was another frontier land, where the levels of accomodation were wide open. Whether a coffee shop or a hypermart, an Australian cookie franchisee or a mobile juice station, the country and its consumers were ready for it all and more.

The drivers that were bringing India's brightest back to native frontiers were now also enticing graduates to stay back. But these institutes were centers of excellence, globally competitive and benchmarked on the quality of its graduates. What about the millions who were not lucky enough to go through those portals?

Rohan is not an anomaly. 2009 was a watershed year for Bollywood, India's glamourous song and dance movie industry. A spunky low budget movie about a young intern learning, within a few weeks into his job, about the power of great customer service and starting a competitor that rockets into the charts in a year, saw most young people in cities rushing to view it. *Rocket Singh: Salesman of the Year* was an average hit on the box office. What was spunky was its main character – a turbaned young Sikh in Delhi, doing not so well at the university, graduating barely but chasing his destiny by learning what modern customer service was all about and starting a blockbuster computer retail company. This was never done before in the history of Bollywood. A turbaned Sikh becoming an entrepreneur and in a Bollywood movie minus the dancing around trees was unthinkable.

In 2010, Bollywood had a blockbuster with another coming of age story of three young men figuring out while at university what they really wanted to do and ending up doing that for real. One idiot gets a fancy job, the second graduates into becoming a wildlife potographer and the third, the rebel, the most popular of the trio, retiring into a corner of the country, away from the buzz and the din, to build and invent appropriate technology for the country and its people, while teaching young children in the local school. This was abnormal in a country where it would be difficult for the parents of a startup entrepreneur to find a good bride for their son.

Three Idiots quickly became the highest grossing Indian movie of all times. The story was not of elite students in elite universities. The country abounds with people who had to fight to get lucky.

They were the idiots. The question that still remained was about how each person could break out of the shackles that constrained innovators as they went about to make, market and monetize their ideas.

The Malthusian Curse and Revolutions

Prosperity in India has always had its fate literally in the clouds. Over centuries, agrarian societies in the entire subcontinent have relied on thousands of waterways and gods to gather clouds for rain, crucial for the survival and prosperity of their people. In 1960, India needed a Green Revolution to bring to naught the predictions of Thomas Robert Malthus. This was a complete revolution where everybody played a role. Policy makers allowed the import of genetic cropping. Farmers adopted new practices. Shining new tractors replaced ploughs. But the real revolution was in how the river was no longer the primary waterway. Thousands of miles of canals penetrated the hinterland, changing forever how farmland was irrigated. Areas prone to drought benefitted from the proximity to these waterways; the clouds brimmed over larger and larger, bringingdown rain down to unleash prosperity all around.

In 2000, the Internet Cable was the new waterway. Miles of broadband cables laid along highways meant that anybody could now use it. Thousands of innovations around the world in computer hardware, software and networking were coming together to become realities. But this was a revolution that was yet to be unleashed in the form that other countries were experiencing. We had last mile connectivity but not many killer applications in place to use it.

It is true that in terms of using the Internet, the country had much in common with the rest of the world, ignoring penetration for a moment. The trend like elsewhere was for businesses to build websites, build better websites and then suddenly realise the use of this new medium to tie together customers and suppliers. This integration was not only about the melding together of processes for the enterprise but also being able to communicate and access data with customers and suppliers, faster and with the possibilities of deriving better knowledge than ever before. So when it came to entrepreneurs, they powered an era of innovation that was about creating better infrastructure, better enterprise software and better access and communication. If one had to break away from this mold, ideas would quickly face up against the wall of Internet penetration and if that would be surmounted, the complexity of design, ease and usage.

The start of this transformation in the country was much like the Meiji reformation in Japan, exceptional individuals who travelled thousands of miles to the west in search of better political, social and economic constructs and committing themselves to learning them and bringing that knowledge back to build new systems at home. Our first generation heroes also travelled in this manner and then returned with a sense of anxiety and urgency to start anew in a land of opportunity.

We have come a long way since that start. The web of 2000 was very unlike the Web 2.0 that we see today. The end of that decade saw the Internet as a mostly urban phenomena for the educated minority with access to computers. In emerging countries like India, Internet penetration was dauntingly low. Yet, did that stop the springing up of thousands of startups - design studios, code houses or system integrators, busy replicating and servicing, somewhat aping the west in wait for a rain of revenues or venture capital? In hindsight, these were the years of experimentation, a time of transformation for the people and their nation. While thousands of Krishnavenis baptised their names overnight to Carren and started spouting British, American or Norwegian accents - millions of projects experimented in an effort to understand what it truely meant to be global.

All of these ensured that the focus was on creating B2B and B2C exchanges, with the Internet as the tool for enabling business processes - a popular trend from the US. Hardly any startups operated within technology domains, leave alone efforts to create newer products, using and for the Internet. This was also the era of globalization for the Indian Information Technology Services sector, as companies like Wipro, Infosys, TCS started going up the value chain with their customers. Lead by companies such as Rediff, IndiaInfoline, Indya, Sify, the Indian web was still in the access and portal syndrome.

India had to wait and watch while the rest of the world moved through a boom and bust rapidly. What remained after the conflagaration was an entire new infrastructure. Starting with better modems, to better speeds; ending with new kinds of middleware and new ways of making hardware, networks and software work with each other; the stage was set for a new cloud to arrive.

The Monsoon Arrives

Only this time it is around the year. By 2009, people were poised to use the Internet cable in a completly new way. We call it Cloud Computing. The revolution that is about to be unleashed is that which can happen only from a monsoon. There is a new cloud. Be it daily news via email, business communication, remote healthcare and education services, travel, the sales of books or managing household utility supplies or right through to social networking using Facebook on mobile phone, we are meshing and mashing technology and its usage, ushering in a new open culture and opportunities for prosperity within our society. This is technology at its best; it removed the physical constraints, while the applications and data could reside anywhere.

When Ravishankar Vishwanath left his well-paying, reasonably self-actualizing employment as the Director of Information Technology services at Symphony, it was symbolic of the prosperity that the rapidly burgeoned services industry had created for millions of educated Indians. He was 43, placed just right to move ahead in the corporate ladder and realized what he had slogged for over two decades. This was his moment. He just needed to continue doing what he was already extremely successful at. Ravishankar decided to break away.

> *"I have always been driven by the Making Things Better philosophy. Maybe it was my education as an Industrial engineer or my early career in equipment product design; I have always been a problem solver. I have believed in the right use of tools and technologies to solve problems of high cost, low comfort and poor quality."*

Ravishankar started e-DOK in 2008, a rules driven cloud based knowledge management tool for obstetricians and gynaecologists to base their diagnosis more firmly on intuition, now more educated with the rules flowing in from previous diagnoses from all the other doctors using the system. Today hundreds of doctors in the south of India are poised to do better what they have been already doing, using their intuition to diagnose.

> *"All of us at some point or the other will have gone through an extended medical experience and I happened to go through that with my father. Everytime I took him for a checkup, I maintained data on his vital parameters like his blood pressure and blood sugar levels and I noticed that I was able to talk more to the doctor on how to take care of my father instead of the Doctor trying to figure out the trends in his medical paramaters. This was always running at the back of my mind when I wanted to start my entrepreneurial journey."*

Using the Internet for work and consuming the Internet to create newer products are two extreme ends. Gone are the days when an Indian entrepreneur would only think about harnessing the Internet to market and deliver regular products, instead newer entrepreneurs are building products for the ones who are on the Internet. We need not only dream of delivering services, instead 22 year olds are building next generation technology, infrastructure and applications for emerging areas such as cloud computing, tapping raw talent for crowd sourcing and harnessing models such as open innovation to drive global change.

Role Models and the Future

We find it hard to imagine how we would have moved so fast, in this span of a decade, without successful role models like Victor Menezes, Rajat Gupta, Vinod Khosla or the ubiquitous Internet and the opportunity to service the world. What would we have done if we did not acquire those hard earned lessons from working with large global products from Microsoft, IBM, Tivoli, Sun and Oracle? Each of these bolstered our confidence to take that small step of building our first little component. Innumerable failed attempts would eventually inspire a complete new generation of young Indians, bent on building their own ecosystem of indigenous software products - Made by Indians.

A new collection of products, services and Internet driven devices are emerging from India. From easy storage to complete computers to self configurable websites for creating On Demand business software; from online marketplaces for farmers to Web 2.0 portals for Indian women, from hot mobile Internet transaction companies to location based gaming companies, instant messaging, local knowledge aggregators, the Cloud is pregnant with limitless possibilities today in India.

When Manil Jayasena pitched camp with her husband Rajen Joshua, 30 years ago at Penukonda in Andhra Pradesh, they had just a shed and the exuberance of youth to do something worthwhile, in a district which until a decade ago was known as the second most drought prone area of India. A brick at a time, a tree at a time, they set out on a journey to change the lay of the land. This was a different and a difficult time. India was not even a developing nation. And in the agonies of drought, few clouds roared here. The Internet, even today, is a distant dream. The monsoon however, is not.

Anantapur today is a prosperous, green district and the hub of energy flows from Penekonda from over 5500 hectares of land imprinted with afforestation seeded by SEDS, the non-profit organization Rajen and Manil founded. At the age of 55, Manil is now the CEO and still retains the energy to break into a jig, but only this time it perhaps comes from the satisfaction of working with over 500,000 people in 250 villages, involving work no longer restricted to just afforestation but now including child welfare, gender parity and clean energy. SEDS put together over 5000 bio gas plants in this district, changing the lives and dreams of people living here.

In 2010, SEDS embarked on an ambitious project to foster gender parity by giving out identity cards. SEDS has recently handed out 40,000 identity cards, changing forever how these women feel about parity with their menfolk. This project was no longer about bricks and trees and patient development over a decade. Scale was important, the management of data cumbersome. SEDS could not afford developers or expensive previous generation software. Manil needed a centralised database, train users, make them self sufficient in their use of the system and finally manage the reason the system had to be in place - give out identity cards to thousands of beneficiaries. Using a cloud implementation, within 120 hours, Manil had an inexpensive pay per user system, gaining the ability to hand out the precious identity cards at the cost of just 1 Rupee for each of them.

In 2010, India launched a new global symbol for its currency

Manil's Cloud at 1 Indian Rupee is here to stay. Ideas which never saw light of the day, those which never received capital and ideas that were not worth exploring a decade ago can get a hearing today. The global recession has put us at par with the rest of the world and so has the modern software development and delivery technologies like Social and Cloud Computing. Unlike other revolutions where our nation was a mere bystander, we have uncovered the true cycle of innovation when it comes to Information Technology - bringing ideas from personal labs to customers as products, learning the art of servicing the world and mastering cost arbitrage and value pricing. Indian entrepreneurs have acquired an understanding of value with a unique sense of our own Indian emotions using the internet in less than 10 odd years.

A massive movement is underway and India and its people are unshackling themeselves from their own clutches towards a new inevitable belief in their destiny. The country is on global sweet spot according to the previous chief of Infosys, Nandan Nilekani. Thanks to the economic liberalization of the Nineties, the phenomenal growth of consumerisation, the traditional belief in market economic principles, rapid development of its science and technology infrastructure and more visibly, millions of positive young minds with global exposure and knowledge - Indians today are spoilt for choice and pursuing their own private economic interests with gusto never seen in the past.

Like any transformed nation, today, India likes to read about its daredevil entrepreneurs every morning. Like any other country in the heady rush of gold – we like to gossip about the performance of our industry sectors and the stock market and the government actions. We take inspiration from unique Internet enabled frugal business models that empower farmers who plough our fields to the hands which diagnose patients via telemedicine or those teachers who tutor mathematics to students in the west in the middle of the night from Cochin in Kerala.

These changes, once thought impossible, are the profound results of technology – the spread of the Internet, mobile and computing penetration in daily lives, society and business in general. From mere suppliers of raw material to actively harnessing its strong talented workforce and becoming the global IT services capital of the world responsible for fostering globalization to newer heights – Innovation and the Internet combined with the Indian mind is a heady mix of iron ore and the new miner. This is the modern replacement of India's precious iron ore, opening up for the country a prominent role in the new knowledge driven Innovation economy.

2010 is a good end to this decade of change. The stories are symbolic of many things. The most important story is however that of the fooling of shackles. Innovation is now about fooling the lack of money to execute, sidestepping the lack of infrastructure to roll it on and breaking the constraints of resources to market and monetize ideas. Perhaps the time is now ripe to set our vision for a billion opportunities, for a billion minds.

What is crucial and missing in this cycle of energy, transformation and change is the availability of capital support for scale. Indian entrepreneurs do not need start up funding as much as they require this support. The way they have broken the shackles that prevent starting up strengthens them in the frugal way for many eventualities. What they are however, ill prepared for is global competition and standards and the need, therefore, is to create structures and institutions which can put wind in their sails as they go intodeeper waters.

It is apparent that capital support systems and entrepreneurial incubation centers have lagged behind when compared with the speed at which innovators themselves have moved. It is important for policy makers and venture support to quickly shift gears and sense this shift in the winds.

And once that is done, the elephant will not only trumpet but stampede.

Sunny Ghosh is the Chief Executive Officer of WOLF Frameworks, an emerging Cloud Computing company that helps innovators convert 'killer ideas' for cloud applications to reality and promotes a powerful, yet simple way for developing business software for the Internet. He is an avid golfer and a seasoned startup specialist, and was previously with NetGalactic, Skelta, Episerver and DigiMaker. He started his career in the telecom domain with Motorola. He holds an honours degree in mathematics with specialisation in competitive product strategies, intellectual capital and software business management from NSRCEL, IIM-Bangalore. He is a voracious reader, and a core committee member of the Bangalore Knowledge Management Community.

Sanjukt K. Saha is the Founder of One Billion Minds, a unique open innovation ecosystem where thousands of early stage innovators from around the world unleash their minds on challenging problems facing people and society in emerging nations. He was previously the executive vice president for India operations at Patton Electronics, and has also worked for FTSE and NYSE listed companies as well as start-ups. He has an MBA from the European School of Management and Technology Berlin, and has attended executive programmes at INSEAD & McGill University. Sanjukt has strong interests in globalisation, strategic investing and open innovation, is widely travelled and networked.

Chapter 27

Patrick Kane

25 Years of .Com

Looking Back and Forward

Editor's Note

This chapter explains that the course of social evolution is not linear; for the past 25 years, we have been living through a spike, all thanks to the advent of the Internet. On March 15, 1985, a small computer manufacturer, Symbolics Inc., registered the first .com domain name – symbolics.com. Since then, Internet use has mushroomed, and will reach 2 billion users in a fraction of the time than it took to reach the first billion users. The Internet now boasts more than 200 million unique addresses, and VeriSign handles billions of Domain Name System (DNS) queries every hour. Emerging trends include the rise of online video; mobile media; and advancements in machine-to-machine interactions. Infrastructure operators have to operate at the leading edge of growth as well as cyber security. It has been estimated that by 2013 the number of devices accessing the Internet will increase to nearly 3 billion worldwide. In addition to marking the 25th Anniversary of .Com, 2010 was truly the year of DNS security, as technologists made major strides in rolling out DNS Security Extensions (DNSSEC), a critical security protocol. With the final remaining linguistic barriers associated with DNS falling away, Indian entrepreneurs and innovators will tap into new audiences and engineer new business models.

The course of social evolution is not linear. Throughout recorded time, we have witnessed brief, intense periods when major political upheavals, social shifts, and technological advancements have led to dramatic spikes in the rate of human development. For the past 25 years, we have been living through just such a spike, all thanks to the advent of the Internet.

On March 15, 1985, a small computer manufacturer, Symbolics Inc., registered the first .com domain name – symbolics.com. At the time, nobody could have predicted the revolutionary change that would be precipitated by this one seemingly small act. In the 25 years since symbolics.com was registered, the Internet and its global addressing system have permeated every aspect of our professional and personal lives.

According to some demographic projections, the Internet will welcome its 2 billionth user before the end of 2011, demonstrating the continued exponential expansion of the technology throughout every corner of the globe. We will reach 2 billion users in a fraction of the time than it took to reach a billion users, and it is likely that we will reach 3 billion users faster still.

But to understand the ubiquity of the Internet, we must look beyond raw numbers. It is not the number of people who use the Internet that makes it so powerful and pervasive, but rather the extent to which the Internet supports and enables our lives. Virtually all aspects of our lives now have an online component. We use the Internet to connect and interact with our jobs, our families, our governments, and even our banks and physicians. As technology evolves, these online functions grow ever deeper and more critical.

Of course, all of this growth creates new challenges. Demands on the Internet infrastructure are mounting exponentially as new users and technologies place enormous new pressure on the network. The rise of online video; advancements in machine-to-machine interactions; and the increasingly networked nature of everything from smart phones to household appliances is driving a torrent of traffic that would deluge the network infrastructure were it not being constantly upgraded and improved.

As we celebrate the last 25 years of the Internet and the Internet's Domain Name System (DNS), it is important that even as we mark our achievements, we look forward to the emerging challenges facing this critical technology. We in the Internet infrastructure community bear a profound responsibility to ensure that our systems and networks are always evolving to support the remarkable innovation and advancement that have been the hallmarks of the past 25 years of the Internet age.

How We Got Here

The Internet addressing boom got off to a slow start. After Symbolics registered the first domain, only five other companies followed suit before the end of 1985. A little more than two years later, only 100 .com names existed, with companies like IBM, Intel, and AT&T among the early adopters. It is tempting to remember the Internet boom as an overnight sensation, but in reality, widespread adoption took quite a bit longer than is commonly remembered. Indeed, the .com boom almost was not a .com boom at all, as early Internet architects considered using the extension ".cor" as a shorthand for corporation in place of ".com."

For the next several years, early adopters slowly, but steadily began to swell the ranks of Internet address holders. By 1992, there were nearly 15,000 .com addresses, up from just 100 seven years earlier. While paltry by today's standards, these numbers represented some of the prime movers in the technology space: companies and organizations that would grow to become global leaders in the span of a few years.

Finally, in 1993, the Internet addressing space got the spark it had been looking for in the form of Mosaic, the world's first graphical Internet browser. Mosaic and other browsers that followed, bridged the gap between highly technical early Internet adopters and the massive casual user base that would fuel the true growth of the technology. Between 1992 and 1997, the .com addressing space grew from 15,000 users to more than 1 million users, and the Internet age had truly begun.

When people recall the story of that early stage of widespread Internet adoption, they tend to focus on the stock market boom and bust cycle that surrounded the first real wave of electronic commerce. But while, the financial history of the Internet industry has been a roller coaster ride of dramatic highs and lows – from the Internet bubble in early 2000, to the following bust, to its robust resurgence throughout the past decade – the technical growth of the Internet has never really slowed.

Since the advent of the browser, the number of users, devices, and addresses on the Internet has grown exponentially. In addition to well over a billion users, and an ever-expanding constellation of networked devices, the Internet now boasts more than 200 million unique addresses. In addition traffic over those devices and addresses has grown even faster.

For a sense of perspective, in all of 1997, VeriSign, which operates the .com and .net domains, processed some 18 billion DNS queries. Today, VeriSign handles that many queries in about 6 hours.

The Foundation for Success

Supporting the remarkable growth of the Internet and the remarkable advancements in Internet technology is one of the most flexible, dynamic, and resilient infrastructural systems ever devised. The Internet infrastructure was created keeping innovation in mind. Its hub-and-spoke architecture supports massive development and change at the edges of the network, while preserving integrity and stability at the core. For more than 25 years, this elegant, scalable model has formed the stable foundation for developments never foreseen by its inventors.

Indeed, the infrastructure has been so stable and so reliable for so many years, that many of us – even those of us in the Internet space – have forgotten how much work goes into ensuring and perpetuating that security and reliability. As an example, for more than a decade now, .com and .net have maintained a remarkable record of 100 percent operational uptime, 24 hours a day, seven days a week, for more than a decade. If you maintain a track record like that for long enough, people will eventually make the mistake of thinking its easy.

The reality is quite different. For operators of critical Internet infrastructure, every hour is a race against the inexorable growth in global demand. In the past 10 years, DNS query volume has increased more than a hundredfold, and we are still nowhere near the upper limit of how high that demand can grow.

There is no silver bullet to managing this unceasing growth. Fundamentally, infrastructure operators must always stay 10 steps ahead of real demand, ensuring that their networks and systems can handle not only normal traffic but also the massive spikes that invariably arise thanks to both legitimate and nefarious activities. This practice of "over-provisioning" is expensive, time consuming and resource intensive, but it is absolutely vital to ensuring the stability and security of the network.

The systems that manage .com and .net traffic at VeriSign are capable of handling more than 10,000 times the DNS query volume they could handle in 2000. To put that in perspective, that the increase is 600 times greater than Moore's Law, the theory that computing power doubles every 18 months.

In addition to the race against rising demand, infrastructure operators are also running another race – one with even higher stakes. This race is an arms race against an increasingly sophisticated global network of malicious actors, who harness the power of the Internet to attack its core infrastructure, either for financial gain or to support political agendas.

Infrastructure operators have no choice but to operate at the leading edge of cybersecurity, because they know that their systems and networks represent the most attractive targets for malicious actors. It's a war fought not day-to-day, but minute-by-minute in thousands of skirmishes large and small over the integrity of the network.

That infrastructure operators have been able to navigate these twin challenges while supporting this remarkable period of Internet innovation is a testament to the hard work and resources that have been invested in the effort thus far, and in the need to expand that commitment into the Internet's future.

The Challenge Ahead

Just as the past 25 years have brought advances completely unforeseen by the Internet's founders, the next 25 years promise to surprise us, even as they fulfill and exceed some of our wildest expectations for the technology. There is no evidence that the wave of innovation that has swept us along for the past 25 years is losing its intensity, and no visible limit on what the technology can accomplish.

Still, there are some things we can predict both about the Internet and the challenges that it will face as it continues to evolve and expand.

We know for instance that traffic and demand on Internet infrastructure will continue to grow exponentially. This is not simply because of the ever-growing number of Internet users worldwide, or their ever-increasing individual use of the global network. Indeed, despite the nearly 2 billion people who are online today, individual users are making up an ever-diminishing and machine-to-machine communications an ever-increasing percentage of total Internet usage.

Which is not to say that individual Internet use is diminishing. Nothing could be further from the truth. But what is true is that human users cannot begin to match the demands on the network being made by the ever-expanding universe of machine-to-machine communications. Where human users are limited by such trivial needs as sleeping, eating and the occasional non-electronic social interaction, machines experience no such limitations.

Five years ago, it was common for households to have only one or two pieces of technology – usually personal computers – connected to the Internet. Today, its common to have half-a-dozen devices connected to the Internet as everything from our televisions to our refrigerators are being equipped to take advantage of Internet connectivity. It has been estimated that by 2013 the number of devices accessing the Internet will increase by 1.1 billion to nearly 3 billion worldwide.

It's not just home devices of course. Highways, energy networks, and healthcare systems are all connected to the Internet to maximize efficiency and create new functionalities. With the potential to maintain ongoing communications with the Internet and each other 24 hours a day, every day, the potential impact to Internet demand is virtually immeasurable.

We know also that some of the efforts we are taking to secure the network will also dramatically increase total traffic and capacity demand.

In addition to marking the 25th Anniversary of .Com, 2010 was truly the year of DNS security, as technologists made major strides in rolling out DNS Security Extensions (DNSSEC), a critical security protocol more than a decade in the making. VeriSign, the Internet Corporation for Assigned Names and Numbers (ICANN) and the U.S. Department of Commerce in 2010 worked together to enable DNSSEC at the root-server level of the Internet, an act that supports global deployment of the technology.

Dozens of Internet domains have now enabled DNSSEC, including .net, which went live with the technology on December 9, 2010. In 2011, even more domains will enable DNSSEC protection, including .com.

DNSSEC makes Internet communication safer by authenticating the origin of DNS information, and thus defeating a dangerous exploit known as a “man-in-the-middle” or “cache-poisoning” attack. But DNSSEC also significantly increases the size of DNS packets. So as more individuals and networks take advantage of this critical technology, the demand on the Internet will only increase.

Finally, we know that cyber threats will continue to grow in size and sophistication, as attackers harness ever-more powerful machines and networks to inflict damage in support of their criminal, and increasingly political, ends.

We must be ready to meet not only these challenges, which we can foresee, but also the inevitable demands and threats that we cannot yet predict. That is the challenge facing all of us involved with ensuring the stability and security of the Internet.

Project Apollo

At VeriSign, we are addressing this issue holistically under the banner of Project Apollo, an ambitious effort to ensure the continued stability and security of the critical Internet infrastructure under our stewardship. At the heart of this effort is a plan to increase our capacity to process DNS queries by more than a thousand times, from a capacity of about 4 trillion queries per day, to a capacity of more than 4 quadrillion queries per day by 2020.

While some may question whether daily DNS demand will reach the 4 quadrillion query-per-day mark, even by 2020, we know from our experience in DNS management that the network must be robust enough to handle even the most severe spikes, so we are preparing and investing accordingly. Project Apollo looks forward, rather than back, in order to ensure that VeriSign’s infrastructure continues its record of stability and security regardless of what new threats and demands emerge.

Project Apollo also includes a substantial investment in strengthening our cyber defenses to meet the next generation of attack and attackers. As a global leader in both managed DNS and DDoS (distributed denial of service) mitigation, VeriSign is working through Project Apollo not just to repel threats to its own systems, but to help other enterprises and organizations to secure their own networks.

Finally, VeriSign is making a significant investment to ensure that its technological infrastructure is able to provide a stable foundation for both the DNSSEC-enabled Internet and the upcoming global transition from IPv4 to IPv6.

India at the Forefront

As one of the most dynamic, fastest-growing Internet markets on earth, India will be at the forefront of the next 25 years of digital evolution. India not only accounts for a large and growing percentage of the global user base, it has also emerged as a hotbed of innovation and a nexus for high-tech and engineering expertise.

Further spurring this rapid growth will be the emergence of Internationalized Domain Names (IDNs) that finally allow Indian users to register entire addresses in Hindi, Tamil, and Urdu and potentially a host of other languages. IDN versions of country code top-level domain (ccTLD) have already been available, and IDN versions of popular generic top-level domains (gTLDs) such as .com and .net could be ready for introduction within a year.

With the final remaining linguistic barriers associated with DNS falling away, Indian entrepreneurs and innovators will tap into new audiences and engineer new business models that take maximum advantage of IDN technology. This in turn will only increase the steep rate of Internet saturation within India.

As India increasingly reaps the benefits of the next stage of Internet evolution, it will also face growing infrastructural challenges as its network architecture is called upon to handle an ever-increasing load of users, data and mission-critical transactions.

Fortunately, India is in an excellent position to manage these challenges and meet the needs of its national user base. The combination of investment, national-level focus on infrastructure and high-level technological talent will give India an edge in managing emerging challenges. The key will be for all stakeholders in the Indian Internet ecosystem to maintain their strong commitment to developing and securing the infrastructure that will serve as the cornerstone of this remarkable growth.

Conclusion

In a world that moves at Internet's speed, it's easy to take our current technological reality for granted, and to forget all of the investment, innovation and effort that brought us to this point. At VeriSign, we have had the privilege to play a role in the Internet revolution and to witness firsthand the tireless and ingenious efforts of the technologists, entrepreneurs, and policymakers who work every day to make it possible.

As the proud stewards of the .com domain, VeriSign took the occasion of the 25th anniversary of the first .com to address as an opportunity to celebrate not only .com, but also the Internet itself, and all of the individuals and organizations that have contributed to its remarkable development.

This isn't just celebration for celebration's sake. By taking a moment to recognize the profound impact that the Internet has had on the world and on our lives, we remind ourselves of why we invest so much time, energy and resources in ensuring its continued growth, stability and security. In the past 25 years, we've seen the Internet evolve from a science experiment, to a commodity, to a foundational cornerstone of our society. With continued diligence, global cooperation and commitment, there is no limit to what we will accomplish in the years to come.

Resources

25 Years of .Com (http://www.25yearsof.com/)
VeriSign's Domain Name Information Center (http://verisigninc.com/en_US/products-and-services/domain-name-services/domain-information-center/index.xhtml)
IDN Information (http://verisigninc.com/en_US/products-and-services/domain-name-services/registry-services/idn-domain-names/index.xhtml)
The Domain Name Industry Brief (http://verisigninc.com/en_US/why-verisign/research-trends/domain-name-industry-brief/index.xhtml)
The Internet Corporation for Assigned Names and Numbers (http://www.icann.org)

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Chapter 28

Vijay Shekhar Sharma

From Landline to Mobile

India's Internet Boom?

Editor's Note

This chapter traces the growth of Internet opportunities from the view-point of an entrepreneur, involved from the early days of ERNET and VSNL's Shell Account days. From Web design to animation, and these days from social media to mobile Internet, the Internet is opening up new vistas for Indian youth and innovators. Useful tips are provided for entrepreneurs in revenue share agreements and exit strategies. India has a terrific opportunity now to not just be a follower but world leader in the wireless and mobile Internet.

In 1994, when I joined Delhi College of Engineering (DCE) for a Bachelors in Electronics and Communication, little did I know what the future had in store for me. Education and Research Network (ERNET), created by the Department of Electronics, Government of India, which connected various universities and research organisations in India, chose me to be a part of the team connecting my college.

ERNET came with one comprehensive feature, an email address on the Internet for its users. It did not include other (now common) Internet features like web, FTP or Telnet. In those days, getting e-mails that you can send to automated bots of IEEE and getting a standard reply was also great fun!

I could have never imagined that what I was working on would become so big. I missed out on my classroom learning and gave up on the latest engineer's fancy programming career! The Internet had taken over my life. I was on the Net, albeit just via email, and spent most of my day trying to decipher its mystery.

Shortly, VSNL also started its services in India, Rs. 10,000 per month subscription (call charges extra!) for an Internet connection. Obviously, it was not for people like me. It was for 5-star hotels to start Net-cafés and add an extra feature to their business centers.

Soon, VSNL discovered a new audience in students and offered a stripped down version called Shell Account at a much lower cost. Even though this shell account had WWW access, email had a text only interface; one could not see any HTML formatting or images anywhere on the Internet.

This was a blind man's Internet, but I absolutely loved it!

Obviously, when you are on the Internet, the first thing you want to do is to create a website. In those days, Web space was pricey and you could only buy it using international credit cards. I didn't have access to one.

One day, I happened to come across PCQuest's Editor PKR's email address pkr@pobox.com and was left awestruck with the fancy email id. With the want for a similar email id, I went on to the Internet, only to find the paywall hassle.

I had created an ERNET connection at DCE. Thus, I got an email address but wasn't happy with its lengthy format (it had dceng.ernet.in domain). Innovation on the Internet has always been the primary driving force for every creator and user. The pogo phenomenon created by the company poboxes.com provided the facility of a free email forwarder.

I was always intrigued by how companies such as poboxes.com earned their revenues, which later I got to know was with the simple concept of advertising. They could send us emails from sponsors and this was in those days equivalent to a direct mailer business. That was the first thing that crept into my mind about business using the Internet. I had thought of creating websites but always kept in mind that there are real world business models waiting to be ported on the Internet. Direct mailer was already there and running successfully. Even when I was in college, I tried my hand at developing a business out of my computer centre. First, I made my college website and due to lack of paid place to host, hosted it on Tripod.Com. Later, I built Delhi rock band Parikrama's website and again hosted on Tripod – knowing well that it was not professional to host a website not having its own identity.

I come from Aligarh where the main export is locks and construction hardware. I realised that exporters wanted a professional website on a paid (advertisement free) location. I kept struggling to find a way to purchase a web host in the US, but as I did not have a credit card, I was unsuccessful in my attempt.

I shifted my focused from hosting and concentrated on web designing. I made web pages, indulged in graphics, and made animated GIFs. It was very challenging to know that a normal looking GIF can animate if you attach many frames and save it in a special web browser format.

In the US, Yahoo had just been launched. Microsoft was struggling to launch a browser. Netscape was running hot. I always idolised Mark Andreessen, the founder of Netscape. Digital used to own a web search engine – AltaVista. They had spun it off as an independent company. Every one was talking about the Internet. Sun Microsystems called themselves the dot in the dot com! Things were starting to grow rapidly in the Internet world.

I was not a big fan of classroom teaching and had been bunking more classes than allowed. which ended me up in the list of students having short attendance I hated to learn about antennas when all I wanted to do was read up on megabytes, data pipes and making hot Silicon Valley start ups.

The Sunday market of Daryaganj had given us access to cheap international magazines (one can go to Daryaganj on Sundays and pick up cheap second hand book and magazines from the street shops!). We were updated by magazines such as Net Guide, PC Mag and Fortune magazines. We dreamt of creating a garage start-up like HP, Disney, Netscape or Yahoo!

I knew I had to do something else, I was not meant for this stereotype education in Electronics and Communication. No wonder I flunked in two subjects – antennas and filter design. I did not want to learn it and I had to attempt to pass.

My principal being a great supporter of new ideas and new initiatives helped me with providing a computer for my hostel room! Now I could use the computer, work offline, create websites and so on.

At this point, I was wondering whether to get a job or start my own company after graduation. I formed a company called Xs! Corps with the - 'The Internet Giant'.

I started to scout for business. I would read job postings in newspaper classifieds for web designers. I would go and meet people and when they would find me suitable, I would tell them that I could not join full time, as I was a student. I asked them to outsource work to me. Most of times they would find it surprising but since skill was not so easily available, I started to get customers. We were in business.

We got a US based customer to give us Rs. 6,000 to create our business cards and letterhead in lieu of his website design. He even bought a web host for us! I had to add an essence of something long term. My friend and I thought about building the largest web directory for India. There was Yahoo but there was not much about India in it.

We worked day in and day out, searching the Internet for sites related to India, creating a web directory structure and finally launched IndiaSite.net. I think we did a fairly good job of it. In those days, the various international directories listed us as the top destination when spoken of India, even above many respected publishing houses' web properties.

I cleared all papers, and graduated in four years. My college education was completed in 1998. I got a job, in software development, in multinational. My family was happy, as I would be going to the US. But I left the company in six months and went back to Xs Corps. My family was devastated. I could not help that much and started doing web consultancy.

It was early days of Internet getting the taste of multimedia. Flash designing came into action. Macromedia became the tool for designers and programmers. Companies could buy domains from Indian companies. Media houses were serious about their Internet opportunity. I worked with my boss Arun Katiyar and accomplished many firsts on Internet projects together.

That same year, Rajesh Jain had sold IndiaWorld in a major deal, opening the floodgates. No one knew how much IndiaWorld was exactly worth and sold for, but it was a mind-boggling figure of US$ 127 million that floated in the news for the next couple of days and the hype of dotcom continued many weeks through all media.

And then came the news of Sabeer Bhatia and his Hotmail. Microsoft acquired Hotmail for a staggering US$ 400 million. Indians were all over the Internet – from being popular in Silicon Valley to making news across the world, for being part of the world's biggest movement – the Internet. Gartner predicted that half of the world's population would be on the Internet in the next 10 years.

I really wanted to walk the path Sabeer Bhatia and Rajesh Jain had shown. We also sold our company, to a New Jersey based company; we sold it for some cash and shares – enough to make us believe that we had made it big! I loved the money and did not want to stop at that. I wanted to create something grand which would have a long term impact. I planned a broadband ISP, called our office Silicon Alley. But nothing seemed satisfactory. Tried to create photo albums where one could share digital photos; developed a remote presentation platform which required no plug-ins; yet not good enough to satisfy my soul.

I had to do something of my own. Something not directed by my boss, but where I would be part of the core thought process and be a part owner too. I quit an immensely high paying job.

Yahoo was big. AOL was around. Yahoo bought Four11.com, a peoples search website, for US$ 400 million. AOL bought MapQuest for US$ 1 billion!

My friend at office left his job to start a mapping company for India. I could not wait much longer and within two months I also joined in, and launched One97.com: a white-page based service for people search in India.

I was running it with my own savings; went out meeting venture capital firms for funding. I was also trying to see if I could build a broadband ISP in India. Finally, I was doing something I loved!

Then 9/11 happened.

And we were struck by recession. All the Internet startups' dreams plunged. No NASDAQ listings, no fancy business ideas got funding. You had to earn your money from customers.

My friends running their mapping company found a customer in India's newly licensed private telecom company. Their mapping software helped network laying and planning. I did not have a full time job and was trying to do Internet consultancy which wasn't doing very well at that moment, when one day I got an offer by Airtel for helping them set up an astrology call center.

I met the manager at Airtel who seemed more interested in knowing if I had a private limited company, and if I could invest in computers. Instantaneously, he offered a deal to spilt 50:50 revenue and all costs of computers, astrologers and mobile phones would be mine, which I gladly accepted.

I was back in the content business. But this time it was different, I was making money and my customers were paying the telecom operator, who shared the revenue with me. We signed up a renowned astrologer and the telecom operator promoted the offerings in media. I was doing better than ever before. I loved my job, business was coming in and with it so was the money. I was on a roll!

But I wasn't content with it, I had to look at scaling it and had to choose to call it either a niche call center or a mobile content business. I did not want to manage so many Pundits telling fortune of people they did not know. Being the typical me, I decided to call it mobile content. It was the start of a new content monetisation. I happened to strike upon it by sheer luck.

I wanted to indulge in various types of content. I had seen cricket, music and news getting the highest page views on the Internet. But doing this was not easy, since it required IVRS (Interactive Voice Response Systems) computers. Not only was it very expensive and cumbersome to build, I had almost no previous experience in it. Every time I went to meet my customers, I became sure of the fact that I had to be in telecom and fulfill my business dream here. I saw them having large inertia and despite my past experiences they were not easily convinced that I could deliver such complex, technology based content services. However, I did not give up and kept looking for the opportunity.

In those days, Bharti Airtel had just bought JT Mobile and was in the process of rolling out its Punjab operations. I was asked to meet a manager in Chandigarh to see if they needed any of my "future" offerings. The guy was glad to meet a Delhi vendor. I was nervous; he pitched an offer of getting all technology and service for free!

I asked him how would I make money and recover costs. He said – revenue share. We will split 50:50, the way we were already doing in astrology service. This time I had to invest and build much complicated technology. There was no assurance of return on investment. It was risky to sell a whole package just on revenue share.

When he asked me, "Aren't you convinced?" I said, "Yes, I am. We will do this." I had just signed the first pure revenue share based Value Added Services deal for all others to follow. What was discovered during that business meeting went on to become the industry standard and the business model for all value added services companies to do business.

I found a Delhi based company to work on developing technology, build and install systems on lease. One97 handled product and content management. In three months, I started getting the money to recover the lease cost and soon we were operating cash positive. I had found the way of scaling in this business.

Music, cricket scores, greetings – mobile was my new Internet. All services that I used to plan on our Web portals were now being delivered to India's mobile customers – just by dialing a number. In this case the service was reaching people who did not have computers and my consumers paid per minute access for the service. The operator, and in turn, we were making money by the minute.

We not only did content, but also built applications to access information, quizzes and games on SMS and voice calls. Indian mobile consumers began finding the services more and more compelling. And this sector became the next big thing in the Indian mobile industry. With the increase in the number of innovations, the customer base also kept growing.

Mobile Internet now reaches more people than fixed line based Internet services. There are more subscribers and more options of charging them as compared to fixed-line Internet service providers.

I raised the level of the playing field by getting funding from Intel Capital, Silicon Valley Bank and Softbank Asia Infrastructure Fund. We invested heavily in capacities and now we handle more than 5 billion transactions from more than 300 million mobile subscribers every month. This is bigger than all other interactive or mass broadcast systems combined!

One97 today, is a telecom application and service provider offering mobile content, commerce and messaging services to telecom providers. We made more than Rs 115 crore (US$ 25 million) of revenue in FY 2010.

It can be safely said that mobile is the true Internet device for India. With the onset of 3G, mobile broadband dream is going to be a reality. There is no better method to reach more than 50 per cent of India's population.

Mobile has changed not only the medium of communication but also access to information. Our innovation Dakia, that brings social community messaging to masses has been quite a big hit with farmers and other rural telecom subscribers, thus, the mobile, being the tool of the masses is also proving to be inclusive.

I have no doubt that in coming years, Indians will depend on mobile for all kind of daily needs – information, content, knowledge, services, commerce and socialisation. Solely because of the population and volume that it would generate, in mobile applications and services business, India would continue to lead from the front. This time, the world will learn from us.

Convergence of Digital Content with Mobile & Internet: The One97 Story – Lessons & Recommendations

All figures are approximate and as on October 15, 2010

I. The One97 Landscape

One97's delivers its services to subscribers of nine network service providers in India (including BSNL), two telecom service providers in Afghanistan and Globacom in Nigeria.

Total number of subscribers for One97 content and applications: 17.43 million

Consumers, who use these services, are charged by their network service providers, who then pay an agreed percentage to One97. In most instances, the value-added services (VAS) provide a source of additional revenue to the network service provider without capital expenditure on their behalf.

One97 is in the process of rolling out a website and an IVR (Interactive Voice Response) mechanism which will enable consumers to make direct payment to One97.

SMS

Consumers can subscribe for certain content such as jokes, film gossip, news, lifestyle tips and cricket scores to be sent via SMS to their handsets.

Number of subscribers for SMS content: 11.19 million*

Voice Portal

The voice portal service offers a suite of applications, including music browsing, ring-tone downloads, caller ring-back tone downloads, chat and messaging applications; dedicated devotional applications, educational applications and applications for rural users.

Additionally, consumers may pay to download or listen to content on a per minute or per call premium rate instead of paying a subscription fee for voice portal.

Number of subscribers for voice portal = 6.24 million*

WAP Portal

Juiceup is One97's proprietary WAP portal where subscribers can access music, movies, information, entertainment, video games and utilities based products and services. Juiceup is equipped with user profile management capabilities, which allows for the delivery of content options based on customer behaviour patterns.

Social Networking Site for Mobile Phones

Oc2ps is One97's proprietary social networking system that enables subscribers to post location-based photos and videos that were taken on both Oc2ps and other social networks such as Facebook and Twitter, among others, all with one mobile interface and one sign in.

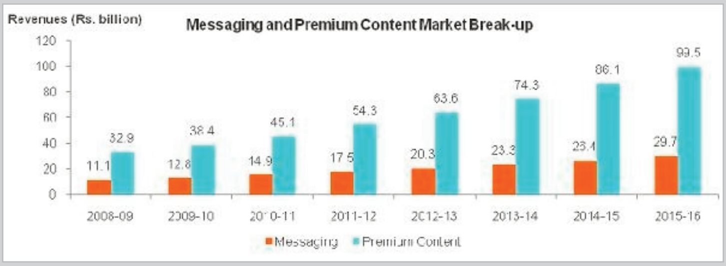
Users can connect and share with their friends on multiple social networks via Oc2ps. Privacy is maintained by allowing access of the uploaded content only through a user name and password. This service provides subscribers with an option to create a backup of the content on their handsets, such as phone book contacts, multimedia content and text messages, to a central server.

Further, Oc2ps has an application store that offers applications that can be used on a wide spectrum of devices. Subscribers can also access content and applications available on a telecom service provider's deck and/or application store. Oc2ps is currently live on a limited basis. One97 is in discussions with several telecom service providers in India regarding a larger-scale launch of this service.

II. Comparison between push content and P2P messaging on mobile market in India

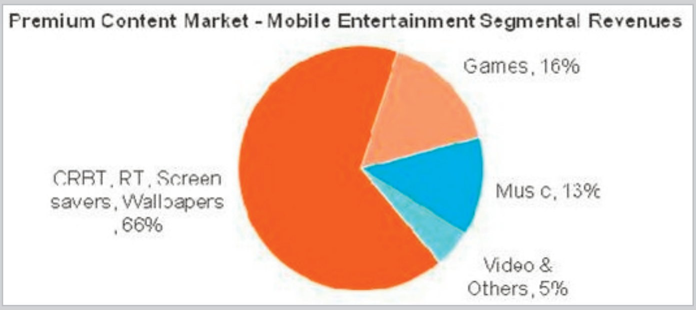
The mobile VAS market can be further divided into mobile messaging and premium content segments.

The Messaging Market: This represented 25.3% of the overall VAS market in India in fiscal 2009. Due to the fact that most content-based services rely on SMS, the messaging market is expected to grow steadily in the future. Revenues generated from messaging services are very low, contributing only 1.4% of the overall mobile services market revenue in fiscal 2009. Application-to-Peer ("A2P") type SMS is typically used by enterprises wishing to send information to their clients. Reasons for using A2P range from information retrieval, alerts and reminders to marketing and sales-related activities.



Source: Frost & Sullivan, Indian Mobile Value Added Services (VAS) Market, February 2010

The Premium Content Market: This comprises of mobile infotainment and other premium content like mobile commerce, mobile banking and mobile enterprise applications. The mobile entertainment segment includes the chargeable entertainment-related mobile premium content such as ringtones, screensavers, wallpapers, icons, music and video. This market has been limited because of stakeholders' narrow focus on the youth segment to generate revenues. Ringtones are the most popular content type followed by icons, music, video and games. Music downloads and Java based games have been increasing in popularity.



Source: Frost & Sullivan, Indian Mobile Value Added Services (VAS) Market, February 2010

The majority of the mobile consumers still prefer low-end handsets, which do not support data-intensive traffic such as music, video and multi-player games. This is one of the main reasons for the comparatively limited revenues resulting from the entertainment segment.

However, segments such as music and video are expected to grow at a faster pace with the onset of high-speed data networks such as 3G and the availability of moderately priced handsets with advanced capabilities. Full track music downloads are anticipated to be key growth drivers in the mobile music segment. The mobile games market is also expected to grow at a steady pace due to the presence of a huge replacement market in India and increasing penetration of GPRS-enabled handsets.

III. Three key emerging trends in Mobile Internet space

1. Mobile internet today is following (and will follow) timing & development pattern of desktop internet (platform - application - services - content - retail/commerce). 3G hitting the inflection points.
2. Rapid surge in video, images, content and communications. This growth trend will stay for next few years.
3. Fast transition of "web-based apps" to "mobile based" -resulting in dramatic rise in usage. Note, it is 24x7 when it is about mobile
4. Surge of demand in rich media, resulting in multi-level innovation in mobile arena; resulting in mobile candies getting replaced with rich multimedia mobile phone at "becoming affordable" cost.
5. Content owners once again becoming respected, but creative & user-generated con tent would have bigger audience. Social content to be another success

IV. Three challenges in Mobile Internet in India

1. Focus on "value to customer" still missing. Innovative pricing along with great user experience, intuitive app ecosystems needs to be well thought through, and offered to customer
2. Regionalization of content
3. Customer awareness - rural power needs to be unearthed (Video makes it easier).

V. Recommendations for government & other stakeholders to facilitate growth of Mobile Internet in India

1. Government should assist and monitor speedy roll-out.
2. Guidelines on QoS (Quality of Service) would be appreciated.
3. The rising demand of smartphone and surging growth in data usage would drive structural changes in telecom equipment, which would have various implications for device and network vendors. We need to proactively plan & regulate it today.
4. Focus on value to customer: better processing power, improved User Interface, suited form factor, low prices and expanding services are key to success.

Vijay Shekhar Sharma is the Chairman, Managing Director and Founder of One97 Communications. He has more than 10 years of experience in the telecom and new media industries, having founded his first venture XS Corps while he was at college, which he sold to Lotus Interworks in New Jersey in 1999. He was previously with Riverrun Software Services Group Limited, Inter Solutions Software, and Startec Global Communications. In these roles he focused on the design and development of various products and applications for the technology, media and telecom industries. Vijay holds a Bachelors degree in Engineering from Delhi College of Engineering. He also actively supports a range of non-governmental organisations doing development work

Chapter 29

Wolfgang Kleinwächter

The New Complexity of Internet Governance

A Challenge for Diplomacy in the 21st Century

Editor's Note

This chapter provides a comprehensive overview of Internet governance. The Internet is now in the Top Ten list of issues on the global policy agenda, for everything ranging from domain names and access models to intellectual property and freedom of expression. The United Nations World Summit on Information Society was the first multistakeholder UN event focusing on how best to use the Internet as a new global asset. Request-for-comment (RFC) Internet governance of hardware, software and nomenclature processes differs from existing top-down models of telecom or intellectual property management. The chapter traces the growth of Working Group on Internet Governance (WGIG), Internet Corporation for Assigned Names and Numbers (ICANN) and Internet Governance Forum (IGF).

One of the biggest opportunities the IGF has is to function as a governance laboratory, a clearinghouse and being on a watchdog. Emerging countries like India can play a key role in this arena

Governance of the Internet, its regulation, the management of its core resources and the various applications and services which appear as innovations on top of these resources are one of the most controversial issues in today´s global policy discussions. The Internet has become a critical infrastructure, both nationally and internationally, which affects policy, economy, culture and the social life of billions of people.

While the Internet had started already in the second half of the 20th century, it was not a priority issue in global politics before the year 2000. But ten years later - at the end of the first decade of the 21st century - Internet has moved into the list of the "top ten problems" on global policy agenda. Players, problems and protocols like Google, Facebook, Wikipedia, eBay, Amazon, Wikileaks, Twitter, Flickr, YouTube, MySpace, Second Life, Street View, Skype, VoIP, WiMax, Internet of Things, Cloud Computing and the like, did not exist 15 years ago. Now all these issues are on the political agenda and have consequences for security, privacy, freedom of expression, intellectual property and the whole global economy.

A New Approach to Global Problems

The first round of a more comprehensive and structured global policy response to the new challenges started in 2001 when the United Nations decided to convene a World Summit on the Information Society (WSIS). UN World Summits became a usual political instrument in the 1990s when globalisation started. However the interesting point with WSIS was that this UN summit was different from previous summits which were convened by the UN on issues like environment, human rights, women empowerment, social development, and so on. While all the previous UN summits were organised as inter-governmental meetings with the aim of reaching formal agreements, WSIS was designed as a multistakeholder dialogue.

In his opening speech at the Geneva Summit in 2003, Kofi Annan, the then UN Secretary General, pointed out, "This Summit is unique. Where most global conferences focus on global threats, this one will consider how best to use a new global asset. We are going through a historic transformation in the way we live, learn, work, communicate and do business. We must do so not passively, but as makers of our own destiny." And he added, "Yet, even as we talk about the power of technology, let us remember who is in charge. While technology shapes the future, it is people who shape technology, and decide what it can and should be used for."[1]

But it was not only the substance which was new. WSIS saw for the first time, in the history of the UN, the inclusion of civil society and the private sector into the policy development process of a UN summit. It is true that previous UN summits on environment, human rights, women empowerment and others also saw a high level from participation of non-governmental organisations (NGOs). However, the NGO activities in these UN summits were separated from the inter-governmental process. In WSIS, the non-governmental stakeholders – private sector, civil society and the academic and technical community – became an integral part of the process.

Although it was unclear in the beginning of WSIS – and it remains a controversy up to date – how the involvement of non-governmental stakeholders in a primarily inter-governmental process should be implemented, the new emerging "multistakeholderism" soon became an accepted concept and constituted the basic principle of Internet Governance.

Originally, the main objective of WSIS was to bridge the digital divide which, at the end of the 1990s, was identified as a big future problem. But soon, Internet Governance moved into the centre of the debate. Governments began to discover that the Internet is the underlying infrastructure for all information society related problems. And here the controversy started.

Previous communication technologies like telecommunication or broadcasting had clear definition and were organised and controlled under a national jurisdiction as telecommunication and broadcasting laws. Related cross border issues – like frequency coordination of allocation of country codes for telephone numbers - were negotiated among governments, settled in form of international conventions and finally led to the establishment of inter-governmental organisations like the International Telecommunication Union (ITU), World Intellectual Property Organisation (WIPO) or UNESCO.

However, borderless Internet did not emerge under a "national Internet Law". It was designed, from the very beginning, as a global infrastructure with the potential to enable communication among all citizens of the globe, regardless of time, space, frontiers and individual citizenships. It was clear, from the very early days of the Internet, that there will be no "national Internet" as we have a "national television" or a "national telecommunication system". As a consequence, any policy or regulations with regard to the Internet have to recognise the global nature of the Internet.

The Internet, as a network of private networks with its borderless design and its network architecture based on the end-to-end-principle, is managed and developed primarily by the provider and users of the various Internet services themselves. The initial general agreement within WSIS, that there is a need for something like a global public policy and eventually a regulatory framework to guarantee the stability, flexibility and further development of the Internet, turned soon into a deep controversy about the "How". Extreme positions on both sides of the spectrum contributed to the growing Internet Governance controversy and complexity as well as different interests among and within the various involved stakeholder groups. Concepts of private sector led self-regulation conflicted with the call for strong governmental regulation with a broad variety of mixed multidimensional policy concepts and co-regulatory ideas in between.[2]

The Myth of the Unregulated Internet

Part of the problem was and is an often repeated myth of the early days of the Internet, that the "network of networks" is a "virtual space" which is separated from the "real places" and does not need any kind of regulation.[3] Futuristic visions, developed by William Gibson, John Perry Barlow and others like the Declaration of Cyber-Independence or the Cluetrain Manifesto helped in the 1990s to open the eyes for the silent revolution but promoted also misunderstanding and confusion about the relationship between virtual netizens in cyberspace and "real citizens within sovereign states". The Internet did indeed broaden the space for individual freedom and create new economic opportunities, but it never escaped from the existing broader framework of national and international legislation. The new Internet freedom never included a freedom to steal money or to harm other people. What was illegal offline became not legal online.

It is true that the development of the Internet in the 1980s and 1990s took place in the policy environment of the United States, which was dominated by concepts of de-regulation (under the Reagan Administration from 1980 – 1988) and private sector leadership (under the Clinton Administration from 1992 - 2000). Neither national parliaments nor international diplomatic codification conferences were involved in the making of TCP/IP or the Domain Name System (DNS).[4] When Jon Postel delegated the management of country code top level domains (ccTLDs) to more than one hundred countries, no national parliament and no national government was involved. It was done by Jon Postel himself via a 'handshake' to a trusted manager.

However, national governments, including the USA and Europe, subsidised research and development of the Internet. Insofar governments were always involved in Internet issues but less in the traditional oversight and control capacity and more in an enabling role.

The development of policies and rules for the Internet evolved rather differently when compared to other areas of social life. Internet standards, codes and guidelines, as described in the Requests for Comments (RFCs)[5], came not top down by majority voting of elected representatives in a parliament, but drafted "bottom up" by the respected and competent key players of the global Internet community and their groups. The RFC-Procedure, launched in 1969 and executed by the Internet Engineering Task Force (IETF), became the special and dominant form of Internet legislation, it produced the "Internet Law Book" with more than 5000 RFCs in place and it broadened our understanding of regulation and governance in the Information Age.[6]

Growing Interdependence between two Different Worlds

In the early days of the Internet, these two different worlds – public policy legislation in real places and technical standard codification in the virtual space – had no or little interdependence. This changed with an ongoing "informatisation" of nearly all areas of daily life in the second half of the 1990s when the number of Internet users grew from ten million to one hundred million and to one billion. Step by step it became evident, that the technical Internet codes and standards had deep political, economic and social implications. The new emerging global Internet infrastructure fundamentally changed the environment for the management of a large number of social issues such as national security, protection of human rights or economic growth. The problem, which complicated the situation, was and is that the technical and political aspects are more and more interwoven in a way which no longer allow a clear split into policy regulation (done by law makers) and technology regulation (done by code makers).

In *Code and other Laws of Cyberspace* (1999), Lawrence Lessig argued that "in real space we recognise, how laws regulate – through constitution, statutes and other legal codes. In cyberspace we must understand how code regulates – how the software and hardware, that makes cyberspace what it is, regulate cyberspace as it is." And he continued, "This code presents the greatest threat to liberal or libertarian ideals, as well as their greatest promise. We can build, or architect, or code cyberspace to protect values that we believe are fundamental, or we can build, or architect, or code cyberspace to allow those values to disappear. There is no middle ground. There is no choice that does not include some kind of building. Code is never found it is only ever made, and only ever made by us."[7]

Lessig opens our eyes to the fact that traditional policy and law making, which frames public policy issues into national and international legislation, finds itself now in a framework which is constituted by technical codes and standards. Like the natural laws of physics, the architecture of the Internet determines the spaces in which public policy can be developed and executed. But while the law of physics are not made by man, the architecture of the cyberspace is constructed by individuals and institutions.

As a consequence, we have two different, but interlinked problems: how public policy is framed inside the global Internet architecture, and how the technical architecture of the Internet itself is designed.

Public Internet Policy: United Nations

For the first category – public policy regulation for human rights, freedom of expression, privacy, security, intellectual property, cybercrime, content of information – the problem is not "Internet regulation" as such. The majority of countries have a national legislation for all these issues, which can be more or less easily adopted and/or adjusted to Internet based applications. The problem is that there is no harmonised international legislation. Some countries have more liberal regulations, others more restrictive. And only in some areas are there international legally binding conventions, as is the case in areas like human rights, the protection of intellectual property or the fight against cybercrime.

The global character of the Internet has not changed the existing legal system but it has challenged it. It has made simple regulatory issues more complex. Trans-border transactions and any kind of communication between two or more end-users can be legally treated by the jurisdiction of the state under which (a) the sender lives, (b) the service providers and the servers, which enable the communication between the end users, operate, and/or (c) the receiver lives. This leads unavoidably to collisions between national legislation in areas where no harmonised global legal framework is available.

To take only one example, while the off-line selling of Adolf Hitler´s fascist book *Mein Kampf* is forbidden by law in Germany, it is allowed under the "First Amendment" of the US Constitution. US-online book shops like amazon.com offer the book for USD 20 in a paperback version.[8] Other cases like auction of Nazi memorabilia via yahoo.com in France, blocking of the domain in Spain or the recent Wikileaks case have demonstrated the complexity of the problem.

This does not mean that the traditional system is broken. It works and remains an achievement of history. Global "harmonisation" of relevant national legislation via diplomatic codification conferences is and will remain an option, but it won´t work anymore in the traditional sense for at least two factors:

- The time factor
  Big codification projects like the Law of the Sea Convention or the Rome Statute of the International Criminal Court needed two or more decades of inter-governmental expert negotiations. If governments could agree on a mandate for an International Internet Law Codification Conference now, an International Internet Convention would probably – in an optimistic scenario - ready for signature in 2020 or 2030.[9] What will be the rule in between? The Law of the Cyberjungle? And who knows how the Internet looks in the year 2030?
- The universality factor
  While an international convention does not need the ratification by all UN member states to become effective, an Internet treaty with only a limited number of signatories would make no sense. It would be like a permanent invitation for "country shopping" by cyberwrongdoers. They would search for Internet paradises in Pacific or Caribbean islands with liberal Internet and ccTLD policies.

Technical Internet Policy: United Constituencies[10]

For the second category – technical standard codification for Internet Protocols, IP addresses, Domain Names – this is different. As shown above, the architecture of the Internet has been developed neither within "national places", nor by nation states. They emerged as a result of a "bottom up" policy development process in the global space on the principle of "rough consensus and running code" by the concerned and affected constituencies.

The reality has proven that norms and principles, which have been developed by non-governmental networks are as successful and workable globally as traditional governmental regulation nationally. And they have reached a high level of efficiency by using open standards which guaranteed universality and avoided the standard wars we know from areas like colour television, VRC or GMS standards, negotiated by inter-governmental organisations like the ITU. Internet regulation, as done by the IETF or later by the World Wide Web Consortium (W3C) or the Institute of Electrical and Electronics Engineers (IEEE), was developed only where needed. Decisions could be achieved with high speed. And the rough consensus principle guaranteed an effective implementation by all main stakeholders and produced the needed flexibility to adjust the set of rules continuously according to technical innovations.[11]

Internet Architecture is a non-material infrastructure. Although it uses physical networks and servers, which can be geographically localised and operated under special national legislation, the zone files of top level domains in the root server, the Internet protocols which enable the communication between networks and servers and the domain names, which constitute something like "the territory of cyberspace" on which whole companies like ebay.com or google.com have created their empires, are virtual resources which have no "nationality" and can't be directly linked to a real place.[12]

Those resources are not only enabling resources, they are also practically unlimited resources. Although there is a limit of about 4.3 billion IPv4 addresses, the transition to IPv6 creates a rather unlimited pool of number resources to address trillions and trillions of subjects and objects. Also the domain names, including the top level domains, are to a certain degree an unlimited resource. There is no real technical barrier to have instead of the 286 TLDs, tens or hundreds of thousands TLDs.

Critical Internet resources are rather different from other natural resources (like oil and coal) which are mainly limited and linked to a specific territory which is under the control of a national government. Even the frequency spectrum or positions on the geostationary orbit are limited resources. Internet resources are like air. You open the window and the air comes in. While there is a need to keep air clean and unpolluted, there is no need of an "air management".

Real Places and Virtual Spaces

The two categories of policy making – governmental top down and non-governmental bottom up - reflect the contrast between two different types of actors who represent two different forms of social organisations with different legal status. On the one side there are hierarchies, sovereign governments, organised in the "United Nations". On the other side there are networks, competent non-governmental groups from private industry and civil society, organised in "United Constituencies". While the "United Nations" are closer to culture of the industrial society, the "United Constituencies" represent the new culture of the information society.

It is a fact that both the real places and the virtual spaces cannot be separated in the information age. Without its virtual components, the real world would not be able to produce the extra value which the Internet is offering and the virtual world needs the real world to make use of its potential. Every virtual communication among netizens starts and ends with a real citizen. There is an objective need for a grand collaboration of both sides for a multistakeholder approach.

Growing Complexity: From the Industrial Society to the Information Society

We know from the theory of media, that new media does not substitute old media but changes the way in which old media operates in the new environment. Practically each new media adds a new layer to the whole media landscape and is regulated in a specific way. This "layer theory" was used also by Alvin Toffler when he wrote his *Third Wave* three decades ago. He concluded that the information revolution added a new layer to the industrial society like the industrial revolution added a new layer to the agrarian society and did not substitute it.[13] The information revolution of today did not remove the industrial economy of yesterday. But it introduced a new layer - the “new (information) economy” - into the global economy.[14]

Issue	United Nations	United Constituencies
Actors	Governments	Private Industry/Civil Society
Structure	Hierarchies	Networks
Codification	National Laws	Universal Codes
International Agreements	Legally Binding Treaties	Memorandum of Understanding
Mission	Broad	narrow
Policy Development	Top Down	Bottom UP
Decision Making	Formally specified, Majority Voting	Informally specified, Rough Consensus
Representation	Elections By all	Delegation by competent Constituencies or via NomComs
Policy Making	Formally Restricted Access and limited Participation	Formally Open Access and broad Participation
Negotiations	Mani closed to outsiders	Mainly transparent and open for outsiders
Result	Stability and Predictability	Flexibility

The discussion around Governance or Global Governance in the information age is not new in political science. Daniel Bell in his *The Coming of the Post-Industrial Society: A Venture in Social Fore*

casting had already observed in 1976, that “the nation state has to become too small for the big problems of life and too big for the small problems” and he concluded that a consequence would be that neither more centralisation nor more de-centralisation should be the answer but a diffusion of governance activities in several directions at the same time. Some functions “may migrate to a supragovernmental or transnational level. Some may devolve to local units. Other aspects of governance may migrate to the private sector.”

In *Powershift* (1990), Alvin Toffler, went one step further, “We live at a moment when the entire structure of power that held the world together is now disintegrating.” This powershift, he describes, “does not merely transfer power, it transforms it.”[15] Joseph Nye from Harvard´s JFK School of Government mapped this later in a matrix which illustrated “the possible diffusion of activities away from central governments, vertically to other levels of government and horizontally to market and private non-market actors, the so-called third sector”.

The discussion was pushed forward in the 1990s, when US President Clinton argued that “the era of big government is over” and that non-governmental actors, in particular from the private sector, have to take the lead in a growing number of global issues.[16]

The United Nations Commission on Global Governance adopted this idea in 1995 and tried to define the concept, in its report "Our Global Neighbourhood", as follows, “Governance is the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is the continuing process through which conflicting or diverse interests may be accommodated and cooperative action may be taken. It includes formal institutions and regimes empowered to enforce compliance, as well as informal arrangements that people and institutions either have agreed to or perceive to be their interest".[17]

Later, in 2001, the Organisation for Economic Co-operation and Development (OECD) Forum for the Future concluded after a series of conferences, that "first, old forms of governance in both the public and private sectors are becoming increasingly ineffective; second, the new forms of governance that are likely to be needed over the next few decades will involve a much broader angle of active players and third, two of the primary attributes to today´s governance system – the usually fixed and permanent allocations of power that are engraved in the structures and constitutions of many organisations and the tendency to vest initiative exclusively in the hands of those in senior positions in the hierarchy – look set to undergo fundamental changes:"[18]

Internet Governance

The coining of the term Internet Governance was neither the result of a serious academic discussion nor of an organised technical standardisation process. There is no RFC which describes in detail what "Internet Governance" is. The term Internet Governance did not appear explicitly in the 1993 US National Information Infrastructure Initiative (NII), which can be seen as the first comprehensive policy framework for the information age. It was also not used in the Bangemann Report of the European Commission in 1994, the European answer to the NII, which underlined the leading role of the private sector. Even in the Global Information Infrastructure: Agenda for Cooperation (GII), presented by US Vice President Al Gore to the ITU World Telecommunication Development Conference in Buenos Aires in 1994 and later to the G7 Information Society Conference in Brussel, February 1995, the term Internet Governance did not appear.

Internet Governance was used as a catchword by some academicians, working mainly under the Harvard Information Infrastructure Project (HIIP) in the middle of the 1990s. It was seen as a "term of art" to describe some management functions related to the core resources of the Internet: the root server service, the adoption of Internet Protocols, the assignment of IP addresses and the management of the Internet Domain Name System (DNS).

With more than ten million registered domain names in 1995, it became clear that the DNS management and related problems would go beyond purely technical coordination. The consensus among the main players at this time was that these critical Internet resources should not be "goverend" by governments. The term Internet Governance offered an opportunity to make a difference to Internet Government and it supported the popular concept of self-regulation.[19]

In 1997, Done Heath, at this time president of the Internet Society (ISOC), said in a speech in Geneva: "We believe that for the Internet to reach its fullest potential, it will require self-governance. The Internet is without boundaries; it routes around barriers that are erected to thwart its reach – barriers of all kinds: technical, political, social, and, yes, even ethical, legal and economic. No single government can govern, regulate or otherwise control the Internet, not should it."[20] This was echoed by ITU Secretary General Pekka Tarjanne as head of an inter-governmental organisation of the UN system when he used the term Internet Governance as a synonym for multilateral voluntarism.[21]

The Making of ICANN

After 1997 the term Internet Governance became more and more popular not only among academicians but also among politicians. It made its way into the official language of the US government, the European Commission and the ITU. It was never defined legally but it became a popular "umbrella concept" to describe the management of the technical core resources of the Internet which was different from other resource management mechanisms such as the frequency spectrum or geostationary orbital satellite positions, both managed by the ITU.

When the US government rejected the idea of bringing the global governance of the DNS under the umbrella of the ITU and proposed an alternative approach in form of the creation of a private corporation for the management of the critical Internet resources, it used the terminology of Internet Governance to justify the launch of the Internet Corporation for Assigned Names and Numbers (ICANN) in 1998.

ICANNs first bylaws reflected this idea of self-governance by a network organisation. The Board of Directors as the highest decision making body of a whole mechanism of related organisations, representing different constituencies, included only representatives of non-governmental groups – technical developers, providers and users of Internet services – while the role of governments was described as "advisory".[22] As a result, ICANN became the first model of a "multistakeholder organisation".

ICANN got a rather limited technical mandate, however its governance structure represented a fundamental power shift. The conceptual idea was that the policy is developed bottom up via the various constituencies organised in Supporting Organisations (SO). The task of the Board of Directors was to coordinate the various efforts and to balance the competing interests of developers, providers and users of Internet services by taking into account (legally non-binding) "advice" from governments with regard to public policy implications. Under ICANN 1.0, nine directors should have come from the supporting organisations, representing the private industry, nine other directors should have come from the At-Large Membership, representing civil society.[23]

Unfortunately, the basic conceptual idea became lost when ICANN started its business. Sandwiched between high expectations, pressure from all sides and an unclear concept on how to define "At Large Membership" the first ICANN Board acted more top down than bottom-up. It behaved like a "governor"; it never elected nine At Large directors; it became involved in a permanent discussion around "mission creep" and it did not get its full independence from the US government.[24] "In many ways," said EU Commissioner Erkki Liikanen in a speech in April 2004, "ICANN is a unique experiment in self-regulation. The expectation among governments at the outset was that ICANN would provide a neutral platform for consensus-building between the key actors who operate the naming and addressing infrastructure."[25]

Under such circumstances, the broader public perceived ICANN – which had no precedent in international policy – not as the big innovation for a new 21st century multistakeholder diplomacy but as a new US controlled "powerhouse" which was labelled by some groups as the "World Government of the Internet"[26]. Such a description was nonsense from the very first day.

ICANN´s Article of Incorporation stated (Article 4) clearly that, "the Corporation shall cooperate as appropriate with relevant international organisations."[27] To guarantee a channel of communication between the ICANN Board and national governments, a Governmental Advisory Committee (GAC) was established. Under ICANN 2.0 governments got something like a political veto-right for ICANN decisions which touch public policy issues. Nevertheless, a number of governments do not feel very comfortable in a position where they can give only "advise" to a private corporation.[28]

The World Summit on the Information Society (WSIS)

For a large number of governments, which were not involved in the making of ICANN, the Internet became an issue only in the beginning of the 21st century, when it started to affect their national economy, policy and regulation. A growing number of governments started to think about new control mechanisms for the Internet. The complexity was formulated by previous EU Commissioner Erkki Liikanen as follows: “It is not realistic to expect governments to take a back seat completely and leave the Internet solely to market forces. The challenge for policy makers will be to find a policy approach that reinforces the Internet's reliability without hindering its potential for further growth.”[29]

When, in October 2002, ITU´s Plenipotentiary Conference in Marrakesh adopted two resolutions, which called for a greater role of national governments in public policy related Internet governance issues[30], it became clear that a separation of the two camps or a “mutual ignorance” between ICANN and the ITU could no longer last. WSIS pushed the “United Nations” and the “United Constituencies” under one roof.[31]

There was a growing confusion about the understanding of what Internet Governance meant exactly. While one group understood Internet Governance as the management of CIRs only, others had a much broader understanding and subsumed under Internet Governance all Internet related issues and problems.

The Working Group on Internet Governance (WGIG)

The three additional PrepComs (Preparatory Committees), which paved the way for the first WSIS Summit in Geneva in December 2003, did not produce any common position on Internet Governance. The only agreement which was reached was to postpone a final decision and to ask UN Secretary General Kofi Annan to set up a “UN Working Group on Internet Governance” (WGIG). Article 49 of the WSIS Geneva Declaration of Principles stated, inter alia: “The management of the Internet encompasses both technical and public policy issues and should involve all stakeholders and relevant intergovernmental and international organisations.”[32]

Article 49 implies that it is impossible to separate the technical from the political issues with regard to Internet Governance, which means that organisations dealing with the various aspects of Internet Governance have to enhance their communication, coordination and collaboration. When Kofi Annan established the WGIG, he did it not in the traditional way by inviting only governments as members (and non-governmental experts as observers) but followed the WSIS recommendation literally and composed the Group of 40 by choosing 20 governmental and 20 non-governmental representatives as WGIG members with equal rights.

At the eve of the first WGIG meeting, Kofi Annan outlined his expectation for the outcome of the WGIG in a speech during the Global Governance Forum in New York in March 2004, “[W]e need to develop inclusive and participatory models of governance. The medium must be made accessible and responsive to the needs of all the world’s people”. And he added that, “in managing, promoting and protecting [the Internet’s] presence in our lives, we need to be no less creative than those who invented it. Clearly, there is a need for governance, but that does not necessarily mean that it has to be done in the traditional way, for something that is so very different.”[33]

The collaborative multistakeholder spirit allowed the production of workable and robust results.[34] Of particular importance was the carefully formulated definition of Internet Governance: “Internet governance is the development and application by Governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet.”[35] The WGIG definition proposes an inclusive and participatory concept which gives all stakeholders a place by referring to their specific role. This definition respects and acknowledges the different status of stakeholders but does not put them in a hierarchical order. It links them together in a network of shared rights, duties and responsibilities.

WGIG: Forum Function and Oversight Function

In the final stage of the WGIG two other issues moved into the centre of the debate: the forum function and the oversight function. Both issues were linked to the question of how stakeholders should be involved into global policy development (forum function) and decision making (oversight function).

The argument of the civil society in favor of a "Forum" was that the creation of a discussion space for multi-stakeholder dialogue could be a useful next step in a bottom up global policy development process towards new "inclusive and participatory models of governance" (as called for by Kofi Annan), to take decisions of a higher quality within the framework of their legal mandate.[36] One group wanted to have a heavy UN Internet Organisation (UNIO), another group was more in favor of a light weight Inter-governmental Internet Council (IIC) on top of the existing private Internet Governance mechanisms. And others argued in favor of the existing ICANN model.

WSIS II

WSIS II adopted in its "Tunis Agenda for the Information Society" (November 2005) the Internet Governance Definition and the Internet Governance Forum (IGF) as proposed by the WGIG but could not agree on a new oversight model. Instead of a "new cooperation model", as proposed by the EU, governments compromised to launch a process of "enhanced cooperation". Based on the accepted definition of Internet Governance, there was a clear understanding that both the IGF and the process of enhanced cooperation have to include all stakeholders in their respective roles. It was also a more or less common understanding, that both processes are - regardless of the separate mandate - informally interlinked. Nevertheless, the open question remained what precisely the "respective role" of the main stakeholder groups could and should be with regard both to the forum and the oversight function.

The Internet Governance Forum (IGF)

Before the first IGF there was a lot of uncertainty. Will the IGF become a useless talking shop, just another annual Internet conference? Will it lead to a new inter-governmental body? There was no blueprint as to how to organise such a forum. The Internet community indeed entered unchartered territory. To get started, the Multistakeholder Advisory Group (MAG) preferred to begin with important but less controversial issues like Access, Openness, Security and Diversity. As the following IGFs proofed, it was a wise decision not to start with the most controversial issues like the management of CIRs. This allowed the Athens IGF to put a more constructive multistakeholder dialogue into the centre of the debate, not by ignoring conflicts, but by avoiding a heated ideological debate. And this worked quite well.

Athens was not without controversies, but demonstrated that even very controversial positions, policies and practices can become the subject of a civilised debate, if the stakeholders respect each other in their respective roles.[37]

Step by step the acceptance of the multistakeholder dialogue grew. The fact that the key decision makers from the various stakeholder groups – from ITU, UNESCO, ICANN and IETF to Google, Yahoo, Cisco, Skype and Microsoft, from Parliamentarians and governmental representative, including Prime Ministers and ministers from the world leading Internet countries like the US, EU, China, Egypt, Brazil, India and others to NGOs like APC, ISOC, Article 19 and the Free Software Foundation – left their "silos", came to the IGF meeting, entered into the dialogue with friends and opponents from other parts of the world and other stakeholder groups and came back to the next meeting, produced soon an invisible value which was recognised by the majority of the participants regardless of their special status.

Another remarkable effect of the global IGF was that its model was meanwhile copied both at the regional and national level. These regional and national IGFs have a double function: They are used to transfer the knowledge and experiences from the global IGF into the regional and national context. And they prepare the national and regional Internet community for the participation in the next global IGF. These forums are mainly driven by activists from the local Internet community.

IGF: Strengths, Weaknesses, Opportunities, Threads (SWOT)

With all the achievements and failures, after five years, the IGF is still in its childhood years. The parents see already the "talent" of the baby, but it is still weak and needs to learn a lot until it is mature enough to take its place in the broader system of international politics.

The most important strengths of the IGF is obviously the fact that it offers a space for high level open, free and unlimited discussion in an informal way among various stakeholders on all relevant issues. It is the cross-institutional, cross–disciplinary, cross-constituency nature of the IGF which makes it attractive to everybody. Furthermore, it has a great teaching, educational and capacity building dimension.

The invisibility of a clear output from the meetings is seen, on the other hand, as one of the weaknesses of the IGF. There are no final recommendations, no agreement among governments, no concrete commitments from stakeholders. However, this weakness is seen by a large part of the community as a strength, as pointed out above. Another weakness, mentioned by many groups is the informal mechanisms for the preparation of the annual meetings, including the procedures for the composition of the MAG, the financial support for the Executive Secretariat and its weak and voluntary reporting back mechanisms.

One of the biggest opportunities of the IGF is to stimulate informal and formal arrangements for sustainable Internet Governance solutions, to function as a laboratory, a clearinghouse, a watchdog and to develop a power of inspiration. It can be seen also as a source of inspiration for other fields of global policies such as climate change, environment, energy and the Millenium Development Goals (MDG).

One threat for the IGF is that the five-year-old baby may be killed in the cradle. Governmental or non-governmental groups who had too high expectations of the IGF could turn their dissatisfaction into discreditation campaigns and a policy blockade. It could be captured by groups of stakeholders and misused to push for single political or economic interests. The needed enhancement of the formal procedures can lead to an over-bureaucratisation.

In summary, it can be said that the IGF is unique. Within five years, the IGF has positioned itself as a corner stone and an indispensable link within the architecture of interlinked Internet events and processes. The IGF is a learning process. A lot of improvements can be achieved. Though the multistakeholder policy mechanism is not a substitute of the traditional inter-governmental system of international relations, it adds a new layer to global policy making and is aimed to improve the quality of the final decision which has to be made by the authorised institutions.

If it comes to decision making, the question of legitimacy moves into the centre of the debate. Democratic elections on a national level are seen as a primary source of legitimacy in the present system of international relations. However there are also other sources of legitimacy rooted in recognised knowledge and expertise, market acceptance or grassroot foundation.

It is correct that intergovernmental organisations, like UNESCO and ITU, get their legitimacy from its member states and their (elected) governments. But non-governmental organisations, like ICANN or IETF, also have a legitimacy to take decisions. In a higher, more philosophical sense conflicts are always driving forces for development as long as they are worked out on the basis of well recognised principles.[38]

Outlook 2015

The UN Secretary General´s report on the IGF from May 2010 seems to indicate that the controversial concept of "multistakeholderism", which has emerged in the process of the UN World Summit on the Information Society (WSIS) since 2001 is now, nearly ten years later, a more or less accepted guiding principle for policy development and decision making with regard to the Internet.[39]

The year 2010 saw a renaissance of a controversy around Internet Governance. The controversy about "IGF improvement" escalated in December 2010, when the UN Commission for Science and Technology Development (UNCSTD), which has the ECOSOC mandate to make proposals for the future of the IGF, established a working group. The decision by the UNCSTD, to allow only governments to participate in such a working group provoked a storm of protest by non-governmental stakeholders. They challenged the exclusive authority of governments to decide what "improvement" means and called for an equal participation in such a working group. This controversial debate reflects the basic underlying conflicts regarding the final decision making authority in Internet Governance: traditional hierarchies or emerging networks or something else?

Even within ICANN conflict is escalating about the legal nature of a "GAC advice." In this discussion, the conflict was about who has the final authority to decide under which circumstances new generic top-level domain (gTLD) can be introduced into the Internet root.

To be clear, as said above, the challenge which comes with Internet Governance is not about "replacement" it is about "enhancement".

A key player in this debate is the government of India which takes partly a "middle of the road" approach. India hosted both an ICANN meeting (New Delhi 2007) and an IGF (Hyderabad 2008) and is supportive to the multistakeholder principle. An expert from India is a member of the ICANN Board of Directors, and the Indian diplomat Nitin Desai chaired both the WGIG and the Multistakeholder Advsiory Group (MAG) of the IGF. However, the Indian government believes that there is a missing link in the institutional architecture of Internet Governance.

During the December 2010 consultations in New York, the India ambassador Manjeev Singh Puri argued that it is unfortunate that there is no international organisation with a clear mandate that provides a platform for cooperation among member stated on key international public policy issues:"[40]. And he continued: "In our view, the process of enhanced cooperation, therefore, has to fill the institutional vacuum in the decision making process on international public policy issues pertaining to the Internet, so as to provide a level playing field for all member states in Internet governance. Such a distinct and separate platform could partner and complement the multistakeholder dialogue under the Internet Governance Forum (IGF) process." On behalf of the governments of India, Brazil and South Africa – the so-called IBSA-Group – he proposed the establishment of an inter-governmental working group under the UNCSTD to prepare a report on the possible institutional design and a roadmap for enhanced cooperation in consultation with all stakeholders and to submit this report to the 66th UN General Assembly in September 2011.

This controversial debate, about the future role of governments in Internet Governance, reflects the basic underlying conflict around the still open question of who has the final decision making authority in Internet Governance and how stakeholders interact in "their respective roles".

What we see in all these bodies is part of a complex power struggle. This power struggle has no clear frontlines and it is also part of a search for new innovative political mechanisms, for a creative diplomacy, which on the one hand respects the UN Charter principles of sovereign equality of states, but reflects also the multiplayer multilayer nature of the Internet architecture.

Nobody expects that the hierarchical organised nation state will disappear in the 21st century. But a growing number of issues, which go beyond the national sovereignty of nation states, can be better managed and governed by new enhanced global multistakeholder networks. And this is not a conflict where "states" are fighting "networks". Diplomatic wisdom should avoid to run into the trap of new asymmetric cyberwars. The challenge of the new Internet governance complexity is to find ways by which two different bodies with different cultures can live and work together to the benefit of all, both citizens and netizens.

References

[1] *Kofi Annnan, Address by the UN Secretary General to the World Summit on the Information Society, Geneva, December 10, 2003, in: http://www.itu.int/wsis/geneva/coverage/statements/opening/annan.doc*

[2] *See, inter alia: Manuel Castells, The Internet Galaxy: Reflections on the Internet, Business and Society; Oxford University Press, 2001; Lawrence Lessig; The Future of Ideas: The Fate of the Commons in a Connected World; Vintage Books, New York 2002; Milton Mueller, Ruling the Root: Internet Governance and the Taming of Cyberspace, Cambridge, MIT Press, 2002; Brian D. Loader (Ed.), The Governance of Cyberspace; Routledge, 1997, Susan J. Drucker & Gary Gumpert; Real Law and Virtual Space: Regulation in Cyberspace; Hampton Press, 1999, Francis Cairncross, The Death of Distance: How the Communication Revolution is Changing our Lives; Harvard Business School Press, 1997; Wolfgang Kleinwächter; Governance in the Information Age, Aarhus, 2001*

[3] *The ideas were widely popularized by John Perry Barlows "Declaration of the Independence of Cyberspace", where he declared "Governments of the Industrial world, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather". And he argued that for netizens, "identities have no bodies, so unlike you, we cannot obtain order by coercion. We believe that from ethics, enlightened self-interest and the commonweal, our governance will emerge". Published in: Cyber Right Electronic List, Davos, February, 8, 1996 http://www.eff.org/~barlow/Declaration-Final.html*

[4] *see, inter alia: Christos J.P. Moschovitis, Hilary Poole, Tami Schuyler, Theresa M. Senft; History of the Internet: A Chronology;, ABC-Clio, Sanata Barbara, 1999, Barry M. Leiner, Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Larry G. Roberts, Stephen Wolff; A Brief History of the Internet, in: http://www.isoc.org/Internet/history/brief.shtml*

[5] *the series was started by Steve Crocker in the 1970s, later managed by Jon Postel and now in the hands of the IETF*

[6] *The RFC procedure differs from the traditional (inter-governmental) standards-makes process of, say ISO, IEC, or ITU, in that it is based on "rough consensus" rather than true consensus. Thus, the "bottoms up" approach is moderated by the fact that, at the end of the day, the IETF leadership makes decisions, which may not fully incorporate dissenting points of view.*

[7] *Lawrence Lessig, Code and other Laws of Cyberspace, Basic Books, 1999, p. 6*

[8] *see an offer by amazon.com under: http://www.amazon.com/exec/obidos/tg/detail/-/0395083621/qid=1092478384/sr=1-7/ref=sr_1_7/103-7687623-7247836?v=glance&s=books*

[9] *Even the Budapest Cybercrime Convention of November, 23, 2001 is an illustration for the sceptical arguments. Negotiations on a "computer crime convention" among member states of the Council of Europe started in the middle of the 1980s. In 1996 the mandate of the negotiation group was enlarged to "Cybercrime". Five years there was no progress. It remains open, whether the convention would have been signed without the terrorist attacks of September, 11, 2001, which pushed a substantial number of governments across their "wait and see" line. 34 governments signed the treaty in Budapest in 2001, but until Fall 2004, only six countries (Albania, Croatia, Estonia, Hungary, Lithuania, and Romania.) have ratified the*

convention. See: http://conventions.coe.int/Treaty/en/Treaties/Html/185.htm

[10] *I use the term "constituencies" in the sense of the different non-governmental groups which have constituted themselves within the process of the making of ICANN. "Constituencies" are networked groups of (competent and informed) individuals and institutions with different citizenships which have common interests, share responsibilities, organize themselves around certain values, speak a similar (technical) language, communicate online and offline and can not be linked to a special country. ICANN is constituted by six constituencies under the GNSO (Registries, Registrars, ISPs, IPR, Business, Non-Commercial), one constituency with potentially 243 ccTLDs Registries under the emerging CNSO, five constituencies under the ASO (the Regional Internet Registries), five regional constituencies under the ALAC, and a number of other constituencies under the Technical Liaison Group, the Stability and Security Advisory Committee and the Root Server Advisory Committee. All these "constituencies" are independent and sovereign organisations and networks, but are "united" under the ICANN Bylaws.*

[11] *While this procedure has made an innovative contribution on the application level it has also its limits. It worked well and fast for an Internet with one million users, but it is much slower for an Internet with one billion users.*

[12] *In practice, the issue is more complex as long as all root servers obtain their data from one "hidden" authoritative server, operated by VeriSign under a contract with the US Department of Commerce (DoC) and DoC must approve any changes to the entries in that authoritative server and can control the entries in all root servers.*

[13] *Alvin Toffler; The Third Wave, Bantam Books, 1980*

[14] *see inter alia Marc Porat, The Information Economy, US Office of Telecommunication, Washington 1978, Dave Tapscott; The Digital Economy: Promise and Peril in the Age of Network Intelligence; McGraw Hill, 1996*

[15] *Alvin Toffler, Powershift: Knowledge, Wealth, and Violence at the Edge of the 21st Century; Bantam Books, 1990, p. 3/4*

[16] *But it remains the role of the state to (1) create an appropriate legal framework (2) ensure that companies don't break the law (3) use tax incentives and/or subsidies to achieve goals other than maximizing profits.*

[17] *United Nations Commission on Global Governance; Our Global Neighborhood; New York 1995.*

[18] *Governance in the 21st Century, Future Studies, OECD, Paris 2001*

[19] *This did not work in other languages. In the German language, where "Government" means "Regierung" ,it is difficult to find an adequate word for "Governance". While some Germans proposed "Management" or "Administration", the majority of authors decided to use the English term "Governance" in the German language.*

[20] *Don Heath; Beginnings: Internet Self-Governance a Requirement to Fulfill the Promise, Geneva, April 29, 1997, in: http://www.itu.int/newsarchive/projects/dns-meet/HeathAddress.html*

[21] *Pekka Tarjanne, Internet Governance, Towards Multilateral Voluntarism, Geneva, April, 29, 1997; in: http://www.itu.int/newsarchive/projects/dns-meet/KeynoteAddress.html*

[22] *see: Wolfgang Kleinwächter; The Silent Subversive: ICANN and the New Global Governance; in: Info: The Journal of Policy, Regulation and Strategy for Telecommunication, Vol 3, No. 4, Fall 2001*

[23] *see ICANN´s first bylaws from November, 6, 1998, in: http://www.icann.org/general/archive-bylaws/bylaws-06nov98.htm*

[24] *see: Wolfgang Kleinwächter; ICANN between Technical Mandate and Political Challenge; in: Telecommunication Policy, Vol. 24, London 2000*

[25] *Erkki Liikanen; Internet Governance: The Way Ahead; The Hague, April, 15, 2004; in: http://europa.eu.int/rapid/pressReleasesAction.do?reference=SPEECH/04/191&format=HTML&aged=0&language=EN&guiLanguage=en*

[26] *When ICANN organized global public elections for five Board Directors, representing individual Internet users, in summer 2000, the German news magazine "Der Spiegel", called its readers to participate in the election of the "World Government of the Internet".*

[27] *ICANN´s Article of Incorporation, November, 21, 1998, in: http://www.icann.org/general/articles.htm*

[28] *see: Wolfgang Kleinwächter; From Self-Governance to Public Private Partnership: The Changing Role of Governments in the Management of the Internet´s Core Ressources; in: Loyola Law Revies of Los Angeles; Vol, 36, No. 3, Spring 2003*

[29] *Erkki Liikanen; Internet Governance: The Way Ahead; The Hague, April, 15, 2004; in: http://europa.eu.int/rapid/pressReleasesAction.do?reference=SPEECH/04/191&format=HTML&aged=0&language=EN&guiLanguage=en*

[30] *see in particular ITU Resolution 102, Management of Internet Domain Names and Addresses, Marrakesh, November 2002; The resolutions says, inter alia:" that the management of Internet domain names and addresses includes: a.technical and coordination tasks, for which technical private bodies can be responsible, and; b. public interest matters (for example, stability, security, freedom of use, protection of individual rights, sovereignty, competition rules and equal access for all), for which governments or intergovernmental organisations are responsible and to which qualified international organisations contribute; in: http://www.itu.int/osg/spu/resolutions/2002/res102.html*

[31] *see Wolfgang Kleinwächter; Beyond ICANN vs. ITU? How WSIS Tries to Enter the New Territory of Internet Governance, in: Gazette: The International Journal for Communication Studies, Sage Publications, Vol. 66/ No. 3-4, 2004*

[32] *Geneva Declaration of Principles, December, 12, 2003, in: http://www.itu.int/dms_pub/itu-s/md/03/wsis/doc/S03-WSIS-DOC-0004!!PDF-E.pdf*

[33] *K. Annan, Internet Governance Issues are Numerous and Complex, New York, 25 March 2004, http://www.unicttaskforce.org/perl/showdoc.pl?id=1333, see also W. Kleinwächter, WSIS, ICANN, GBDe: How Global Governance is Changing in the Information Age, in B. De Schutter & J. Pas (Eds.), About Globalisation: Views of the Trajectory of Mondialisation 205-226 (2004); W. Kleinwächter, Internet Co-Governance: Towards a multilayer multiplayer mechanism of consultation, coordination and cooperation (M3C3), 3 E-Learning 473 et seq. (2006) and W. Kleinwächter, Internet Governance: Auf dem Weg zu einem strukturierten Dialog, in D. Klumpp, H. Kubicek, A. Roßnagel & W. Schulz (Eds.), Medien, Ordnung und Innovation (2006).*

[34] *The WGIG Report (July 2005) defined Internet Governance as follows: "Internet governance is the development and application by Governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet.", in: http://www.wgig.org/WGIG-Report.html. This definition was became Article 34 of the Tunis Agenda on the Information Society, November, 24, 2005, adopted by the Heads of States, see: http://www.itu.int/wsis/docs2/tunis/off/6rev1.pdf*

[35] *Report of the Working Group on Internet Governance, Geneva, July 2005, see: http://www.wgig.org /docs/WGIGREPORT.pdf*

[36] *The idea to create such a discussion space originally in form of a "Multistakeholder Observatory Council" was proposed officially for the first time in a statement of the Civil Society Internet Governance Caucus (IGC) at the WSIS InterSessional Meeting in Paris, July, 16, 2003. Such a council, the statement says "could serve as a meeting point for improved coordination, consultation and communication on ICT issues. Such a "Council" should be composed of representatives of governments, private industry and civil society. It could promote the exchange of information, experiences and best practices on issues from privacy to free speech on the Internet, from IPR to eCommerce, from Ipv6 to ENUM. Listening to the good experiences of others is a cheap investment and could become a source of inspiration for innovative policy development in the 21st Century. See: http://www.itu.int/wsis/docs/pcip/plenary/Internet_governance_group.pdf*

[37] *See: Avri Doria & Wolfgang Kleinwächter (ed.), Internet Governance: The Forst Two Years, ITU/UNESCO, Paris/Geneva 2008, p. 124 ff.*

[38] *It is worth to notice that in the Articles of Incorporation of ICANN there is a clear reference to international law.*

[39] *Continuation of the Internet Governance Forum: Note of the UN Secretary General, ECOSOC, May 2010, in: http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan039074.pdf*

[40] *Statement by Ambassador Manjeev Singh Puri during the UN Secretary General´s Consultations on Enhanced Cooperation on International Public Policy Issues Pertaining to the Internet, New York, December 14, 2011, see:. http://www.unpan.org/DPADM/EGovernment/WSISImplementationMechanism/StatementsonEnhancedCooperation/tabid/1450/language/en-US/Default.aspx*

Wolfgang Kleinwächter is Professor for International Communication Policy and Regulation at the Department for Media and Information Sciences of the University of Aarhus, Denmark. Before that he had appointments at the University of Leipzig/Germany, University of Tampere/Finland and the American University in Washington. From 1988-1998 he was the President of the Law Section of the International Association for Media and Communication Research (IAMCR). He has been involved in the development of policies for the Internet Domain Name System since the middle of the 1990s. He has participated as an independent observer in all ICANN Board Meetings since Singapore (March 1999). He was a member of ICANN´s "Membership Information Task Force" (MITF) and became a co-founder of the "Civil Society Internet Forum" (CSIF). He is also the initiator of the ICANN-Studienkreis, an open platform of Internet activists from policy, economy, academia and the media. He has finished a book on Self-Regulation of the Internet and ICANN

Sam Pitroda

Democratising Information

The seeds of the Indian IT journey were laid in the 1980s under the vision and leadership of Prime Minister Rajiv Gandhi, who was a firm believer in the transformative potential of technology. This support was critical when we started to build the first foundations of telecom infrastructure in the country. The hard work, dedication and skill of a few committed individuals in the 1980s started India on the trajectory of IT growth and success that has become the cornerstone of its success on the global stage today.

During one of my interviews in India two years ago, I was asked a very basic question –"What is my view of technology in India?" I turned this question in my head and thought of the role technology had played in shaping the growth paradigm and whether it was fulfilling its potential in enhancing access and development in the country. I feel that in the 21st century, technology has an unparalleled role to play in empowering people, transforming governance and creating a more informed and participative citizenry. However, we in India still treat it as a luxury, an urban fascination and don't quite understand how it can be leveraged in improving systems and processes, which can impact both the urban and rural communities.

While we have new developments in the form of 3G, cheaper solar power, advanced biotechnology research, we have not paid adequate attention to leveraging these to deliver benefits across the spectrum and to address the technological divide among our masses.

This is where technology and Internet will play a major role. We need to build the right information infrastructure to deliver public services in a more efficient and transparent manner. We need to redefine the role technology can play in a society like India by linking it to better delivery of services for the underprivileged in the country. To a large extent this will require a move towards the next generation of information infrastructure – from voice to broadband.

While we have made huge strides in voice telephony, our broadband access is very minimal. We are only at a meager 10 million broadband subscription as compared to China's 113 million. The broadband penetration in India is less than 1 per cent and more than 85 per cent of the broadband subscribers use DSL technology. This is indeed a glaring gap compared to other developed and emerging economies. Ideally, this country needs 100 million broadband connections to truly empower people with access and information.

Further, we are still defining broadband in India with a speed of 2mpbs which is very slow as per global standards. We need to redefine broadband speed to 10mpbs and going upto 100mpbs. This will be critical for the latency and high bandwidth required for the applications in areas such as health, education, employment and agriculture.

I feel that creating a broadband platform will be crucial going forward because this will be a key piece in enhancing access to information. Broadband penetration, especially at the Panchayats, which are the local centres of governance, will herald unprecedented decentralisation, accessibility, openness, transparency and connectivity. This will in due time redefine the governance paradigm, ensure access of information to the public, improve processes and enhance service delivery to citizens. This will address information asymmetries in the country and empower the grassroots. Broadband will also require applications in diverse areas such as heath, education, agriculture, skill development, with a focus on the needs of the Panchayats. We will need to put collective thought into harnessing technology for delivering benefits for all segments of society and not just for the urban rich.

As Adviser to the Prime Minister, I am working on a plan for creating public information infrastructure in the country. The backbone of this infrastructure will be two core projects: the National Knowledge Network, a high bandwidth network to connect 1500 nodes, including all universities, labs, R&D institutes, to enable knowledge sharing and collaborative research. The second project will aim to connect the 250,000 Panchayats in the country to broadband through fiber optics to take e-governance to the grassroots level. Our vision is to provide every Panchayat with broadband connectivity, supplemented by infrastructure in the form of hardware/ software and trained manpower. In this context, applications will have to be developed to improve education, healthcare, and public services such as birth certificates, admissions, land records, infant mortality, female literacy, etc. which will effectively leverage the potential of broadband. I believe that once this eco-system is created at the Panchayat level it will improve service delivery and governance by placing information and knowledge in the hands of the citizens and will also unleash new opportunities and potential in the rural communities.

The key issue to remember here is that unless and until we have robust public information infrastructure nationwide with proper access, it is not possible to provide timely and relevant information to our citizens.

With the Right to Information, the Government has taken the first steps towards accessibility of information and transparency. To democratise information further, we need to build public information infrastructure through broadband and plug multiple platforms into it, including UID, GIS, Applications, Security and Payment. This will require collaborative engagement among all the stakeholders, including members of civil society, and will create an informed and empowered citizenry.

Let us open up our systems and begin to make ourselves accountable and more transparent. Information flow is always bi-directional and is a healthy process for a society to sustain growth. The more information you open out to the masses, the more will be pooled in back, thereby creating a self sustaining pool of knowledge.

The focus also has to be on creating our own indigenous content based on our rich repository of local knowledge, which can cater to our unique needs. Our focus should be on creating our own unique applications, data and experiences for people to share that is very local to us.

We are not only the largest democracy but also a democracy focused on bringing information to the doorstep of people to enable a move towards Open Government. The next decade is going to be the most crucial decade in putting institutions and infrastructures related to information systems in place to take advantage of the power of a connected billion people.

Getting the grass root level connected is extremely important and a mission for us since that forms the nerve centre of decentralised governance. We cannot afford to ignore rural India. I remember quoting once in an interview that, "If Bangalore is the back office of America, rural India should be the back office of urban India." Gandhiji's dream of creating self-sufficient village communities is now possible through IT which will connect every village in India with every other part of the country and will provide a window to the world at their doorstep.

The past 15 years have shown us glimpses of what the Internet can achieve if tapped strategically. Internet will be a key tool in shaping many of these changes in the country. I am pretty confident that once information infrastructure is created, numerous applications, innovations and solutions aimed at our unique needs will emerge. India is going to witness this in the next decade and we are all working towards the single goal of creating a nation that will soon be known for its Information Democracy and Open Government. All this is achievable through the power of the internet.

Hence, I wholeheartedly appreciate this effort by the authors to chronicle the last 15 years of internet in India. We need to capture what we have had so that we can seek out new frontiers for the next decade. I am thankful to the authors for giving me this opportunity to express my thoughts and visions to the readers. I am glad to be part of this venture and I wish them all the very best.

I earnestly request all the readers to take a leaf out of this book and come up with newer ideas that will go down in a new page in the next decade.

Sam Pitroda is Advisor to Prime Minister, Public Information Infrastructure & Innovation, Goverment of India . He was earlier Chairman of National Knowledge Commission, Goverment of India.

Chronology of the Internet in India

1986: ERNET project starts up; email exchange using UUCP protocol established between National Centre for Software Technology, Bombay and IIT Bombay (Bombay was renamed Mumbai in 1995)

1987: Email exchange between ERNET institutions in metros; TCP over X.25 established between the ERNET gateway at NCST and Internet via CWI in Amsterdam

1988: TCP/IP connection between ERNET's gateway at NCST and UUNET's gateway in Falls Church, USA; domain registration for Internet access initiated on behalf of ERNET by the ERNET team at NCST, Bombay

1988: Leased lines used to connect ERNET partner institutions to ERNET gateway in Bombay

1989: LWBBS (Live Wire BBS) and BBS CiX launch online services; VSNL commissions a Gateway Packet Switching System (GPSS) running X.25 protocol; ERNET acquires an analog leased line operating at 9600 bps to connect ERNET gateway at NCST, Bombay to UUNET in the US

1990: TCP/IP implemented for communication between ERNET centres connected by leased lines

1992: ERNET's overseas link from Bombay to Falls Church upgraded to a 64 Kbps digital leased line

1991: LWBBS turns into a paid subscription service and expands to other cities such as Ahmedabad, Madras (Chennai), Pune, Calcutta (Kolkatta), Baroda, Vapi

1992: Business India launches aXcess, a value-added services offering e-mail as well as e-news, stock quotes

1994: ERNET establishes a hub in Bangalore to provide TCP/IP level connectivity over satellite links to locations otherwise unreachable by dedicated circuits

1995: VSNL introduces public Internet access in India via dialup services in 6 cities on Aug 15,1995; IndiaWorld portal launches on March 13

1996: Major newspapers such as The Times of India, The Hindu, The Indian Express and Hindustan Times set up websites; Rediff.com launched; India's first Cyber Café launched in Mumbai

1997: Tamil newspaper Dinamani sets up website; Hotmail creator Sabeer Bhatia sells Hotmail to Microsoft for $400 million; first online banking site launched by ICICI Bank; Naukri.com launched (this becomes one of India's first profitable dotcoms); IndusInd also launches Web site; Khel.com cricket site launched

1998: Private ISPs allowed to set up Internet infrastructure; LWBBS's Pune node, JabberWocky operated by WMI becomes first ISP licensee; Sify becomes India's first national ISP license holder; first major hacking case (teenagers hack data on BARC's servers); launch of NASSCOM to promote IT industry by efforts of Dewang Mehta; cybercafés start mushrooming across Indian cities; annual India Internet World conference series starts in Pragati Maidan

1999: Indiaworld sold to SIFY for US $115 million (Rs 499 crore) triggering the dotcom boom in India; Hindi portal Webdunia launched; large number of dotcoms appear, mostly modeled as e-marketplaces but have untested revenue models and big spends; Webdunia, India's first and most successful Hindi portal launched; Sify lists on NASDAQ (first Indian Internet company to list in USA and second in any category); Sify sets up hundreds of public Internet kiosks under the brand name i-Way; New Telecom Policy 1999 launched by DoT; Indian ISPs allowed to setup satellite international gateways; IndiaInfo portal launched

2000: Parliament passes Information Technology Act 2000; foreign portals like Yahoo and MSN set up Indian sites; Baazee.com launched based on the eBay's model; Indya.com launched with Rs 4.5 crore campaign blitz; birth of online journalism: Tehelka.com exposes cricket betting scandal; ITC launches e-Choupal initiative to take the Internet to the villages; Railtel Corporation of India launched; NSE launches online stocktrading; cable Internet starts replacing dialup Internet connections; 2000: Rediff IPO on NASDAQ; Sulekha.com legal entity founded in Austin, Texas

2001: Subscription sites set up by thenewspapertoday.com and NaiDunia.com; Times of India group launches 8888 mobile service; India Today group launches 2424 mobile service; first cybercrime related arrest (two arrested for hacking go2nextjob.com); Indian Railways launches online ticketing site (irctc.com) which soon becomes India's largest e-revenue earner; India's first cyber crime police station opens in Bangalore; Dotcom bubble bursts – many sites close, some go into hibernation; C-DAC announced the launch of its Multilingual Advanced News Automation System: MANAS; GAIL India launched; Andhra Pradesh state government launches e-procurement portal and extends public Internet kiosk facility to every mandal office

2002: MalayalamVarikha.com, the website of weekly Malayalam magazine, launches paid site; NPTEL (National Programme on Technology Enhanced Learning) initiative launched; India's first teleradiology company Teleradiology Solutions launched; Indian ISPs allowed to setup submarine international gateways; Wikipedia.org adds Assamese, Punjabi, Nepali, Oriya, Malayalam content

2003: AirDeccan launches India's first online air ticketing site; NIXI (National Internet Exchange of India) set up; WiFi (2.4GHz) deregulated by GoI; official representation from

India’s DoT and DIT at WSIS 2003 in Geneva; AirTel launches broadband Internet access; Wikipedia.org adds Bhojpuri, Marathi, Kannada, Hindi, Kashmiri, Tamil, Telugu, Gujarati, Sanskrit, Sindhi content

2004: DoT declares its Broadband Policy; BSNL introduces broadband; e-Bay buys Baazee.com; Monster.com buys Jobsahead.com; NIXI takes over the management of the .IN Registry; ITC e-Choupal demonstrates rural Internet adoption; Google starts India office; Wikipedia.org adds Bengali, Urdu content; Sulekha starts India operations; eBay India CEO arrested for alleged sale of porn online, but later released -- the arrest is highly criticised by industry

2005: Social networking sites like Orkut make their presence felt; online registration of .IN domains begins; Indic language user interface appear on basic cellphones

2006: Facebook makes India debut; OneIndia.in portal launched; National E-Governance Plan launched; Naukri.com IPO in India

2007: Major media websites switch to tab-based design arrives; Arzoo.com re-launched as a travel portal by Sabir Bhatia; Twitter makes its India debut; Google News launches Hindi service

2008: India sets a world record by sending 10 satellites into orbit in a single launch; Apple i-Phone debut in India; Internet Governance Forum (IGF) held in India; Google News launches in Tamil, Malayalam, Telugu

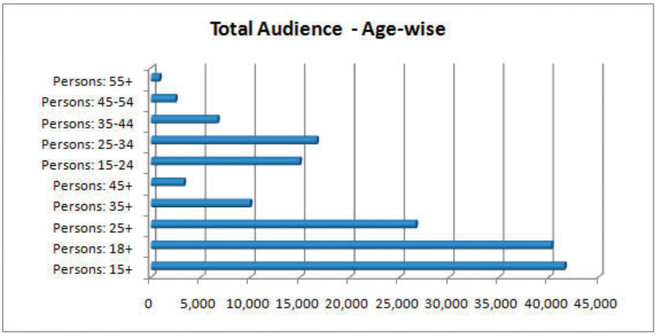
2009: GoI puts forth the draft policy on Indian language IDNs

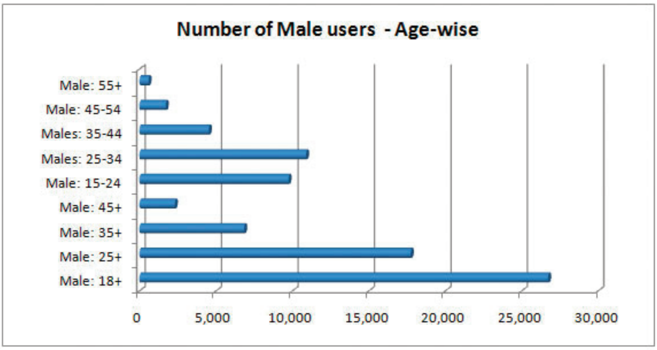
2010: 3G spectrum auctioned to telecom players after two-year-long process; WiMax licenses auctioned; GoI announces National IPv6 Roadmap; TRAI releases National Broadband Plan; MakeMyTrip lists on NASDAQ at over US $ 1 billion; Facebook overtakes Orkut in India

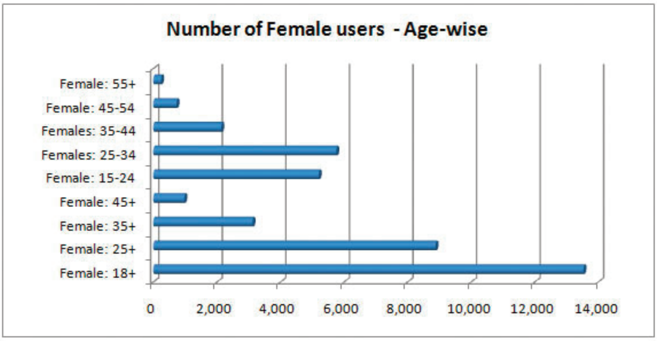
2011: Mobile number portability launched; ICANN approves 7 Indian language Internationalised Domain Names (IDNs) for India; iPad enters India market after its Dell and Samsung rivals; Pearson Group takes controlling stake in e-education startup TutorVista; Indian government launches National Knowledge Network (NKN); Indian Internet startups Komli Media, LetsBuy.com bag $21 million venture capital deals; India's 2011 census uses social media; IIT courses, lectures made available online

Illustrative Demographic Profile of Internet in India

comScore, Inc.







Source: comScore, Inc. Extended Universe for online population in India estimated is different than comScore's Total Internet estimate. comScore estimates India's Extended Universe to be 74,105,973. comScore Media Metrix monitors the online activities of individuals within a universe defined as those aged 15+ who have accessed the internet from either a home or a work computer in the past 30 days. A significant number of consumers access the internet from outside that universe definition, like those under 15, or people who access the internet from an internet café, or other public/shared computers, but because comScore does not have panelists from that part of the online population so they cannot monitor their activities.

Madanmohan Rao

Dr. Madanmohan Rao is a consultant and author from Bangalore. He is the editor of five book series: "The Asia Pacific Internet Handbook", "The Knowledge Management Chronicles," "AfricaDotEdu," "World of Proverbs," and "Global Citizen." He is a frequent speaker on the international conference circuit, and has given talks and lectures in over 75 countries around the world. Madan is research project director of Mobile Monday; Madan was formerly the communications director at the United Nations Inter Press Service bureau in New York, and research director at the Asian Media Information and Communication centre (AMIC), Singapore. He graduated from the Indian Institute of Technology (IIT) Bombay and the University of Massachusetts at Amherst, with an M.S. in computer science and a Ph.D. in communications. Madan was on the nominating committee of ICANN (International Corporation for Assigned Names and Numbers) and was on the board of directors of CPSR (Computer Professionals for Social Responsibility). Madan has served as a juror for the Manthan South Asia e-Content Awards, mBillionth South Asia Mobile Content Awards, World Summit Awards Mobile, Mobile Monday Global Peer Awards, and Mobile Marketing Association Global Awards.

Osama Manzar

Travelled more than 1000 villages in India and 20 countries, Osama Manzar is a convert social entrepreneur, working with people at the edge of information through Digital Empowerment Foundation (DEF). He is Member Working Group – Internet Governance and e-Governance, Ministry of Comm. & IT, Government of India. Curator of mBillionth Award South Asia, recognising and mentoring Mobile Content, Application & Services; He is Chairman of Manthan Award South Asia recognising innovations in Digital Inclusion for Development. He has authored titles like: "Development & Digital Inclusion – Cases from India & South Asia", "e-Content: Voices from the Ground" in 2 volumes in 2003 and 2005 and "Internet Economy of India" in 2001. He is e-Content Expert for India for World Summit Award (WSA), Grand Jury Member and member of Board of Directors; Awarded a joint Chevening/Young Indian IT Professional Programme 2002 Scholarship by the Foreign and Commonwealth Office to study Advanced IT Management Programme at Manchester Business School, during 2001-2002; Post Graduate Diploma in Journalism and Graduated in Physics. He has worked through Computerworld as assistant editor, head of Interactive Media Division of Hindustan Times and started a software company 4Cplus, for media publishers and exited the same to get into social entrepreneurship.

India is one of the largest Internet markets in the world and has a unique mix of digital excellence along with digital divide. From e-commerce and digital news to gaming and e-government, India has changed a lot over the last 15 years since commercial launch of the Internet.

Over 30 experts have contributed to this unique landmark book, providing a guide and analysis of the wide range of Internet impacts and growth in India. Thought-provoking insights and in-depth analyses are accompanied by actionable tips and roadmaps. A chronology of Internet developments in India has also been compiled.

Ten years ago, Madanmohan Rao and Osama Manzar co-authored the book, "Internet Economy of India" in 2001, and are back with another authoritative chronicle of India's Internet story.

netch@kra

I earnestly request all the readers to take a leaf out of this book and come up with newer ideas that will go down in a new page in the next decade.

- Sam Pitroda, Adviser to PM,
Public Information Infrastructure & Innovation,
Government of India

There has not been a similar effort before, which has aimed at chronicling the growth of Internet in India in the last 15 years. It becomes essential to chronicle the events in order to critically engage with the questions and concerns we are dealing with relating to the Information Technology era.

- Jyotiraditya M. Scindia, Honourable Minister of
State for Commerce & Industry,
Government of India

"IT" may well stand for India Today or Incremental Transformation. Nothing can take away the fact that the Internet has transformed India and it has added one more hue to the rainbow that this nation is.

- N. Ravi Shanker, Joint Secretary,
Department of Information Technology
CEO of NIXI (National Internet Exchange of India)

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