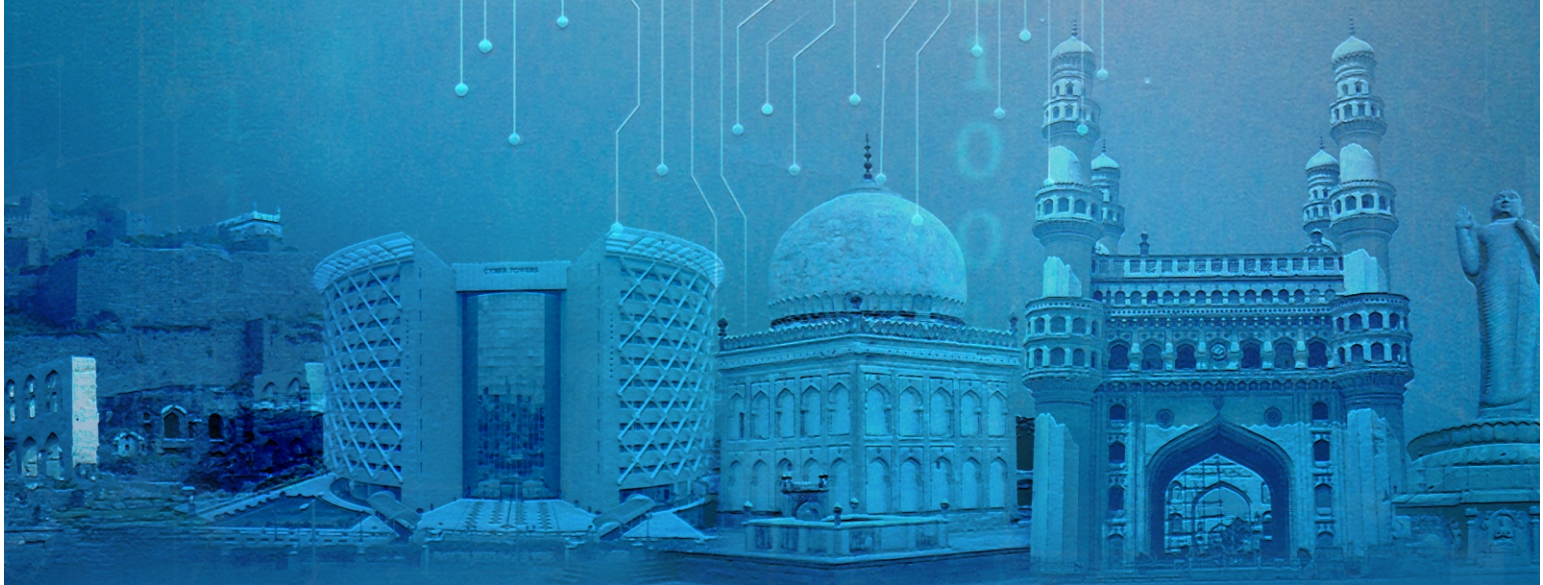
Dr. Marri Channa Reddy
Human Resource Development
Institute of Telangana

THE IT INDUSTRY IN TELANGANA



CDPP
CENTRE FOR DEVELOPMENT POLICY AND PRACTICE

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ABOUT THE PROJECT

Hyderabad's journey towards transforming into a cybercity began in the 90s. Several software companies, business process outsourcing (BPO) firms, call centres, and other technological services were set up in the city, making it a premier destination for all call centre operations and technological innovations in India. Today, it has become the hub for information technology and IT-enabled services. Skilled human capital, a stable political climate, and a conducive working environment prompted information technology giants around the world to set up operations in the city. The state government's role in attracting and retaining multinationals has been particularly remarkable. In Hyderabad, the government's liberal industrial policy for the IT sector has played a pivotal role in fostering economic growth in the city.

Moreover, investments in the digital infrastructure and the construction of several campuses to house companies investing in the city's IT growth have significant enablers. For instance, the HITEC City (Hyderabad Information Technology Engineering Consultancy) was developed as a significant technology township with several campuses and phases; residential areas and convention centres and malls. Several multinational IT giants have made the city their base of operations in India, including Accenture, Oracle, Verizon, and IBM.

Dr. Marri Channa Reddy Human Resource Development Institute of Telangana (MCRHRDI) has commissioned this project to capture the story of growth, transformation, innovation and evolution of Hyderabad into one of Asia most preferred destinations for IT firms. This study shall collate historical records, current statistics, and ethnographic data to document the establishment of Hyderabadi IT companies and their journeys from inception to today and beyond.

VISION STATEMENT

K. T. Rama Rao

Hon'ble Minister of IT, Industries and MA&UD, Government of Telangana

Hyderabad of the 21st century is synonymous with Information Technology. However, arriving here has been a work in the making for decades. Heavy Electrical and Electronics industries, established in Hyderabad in the late 1960s, kick-started this transformation. The establishment of these industries ushered technical talent into the city from across the nation. A couple of decades later, starting in the mid to late 1980s, the children of this first generation of Hyderabad's technical professionals kick-started laying the foundation for the city's phenomenal growth in the digital world of the 21st century.

In Hyderabad's multicultural environment, the spirit of entrepreneurship has helped the city organically transform. From the late 1990s, the government and bureaucracy worked hand in hand with the private enterprise of small, medium businesses to make the city's business atmosphere conducive to IT trade. Criticality required to sustain the IT industry kicked in with the past and the current governments going on a mission soliciting business and rolling out red carpets to these job creators.

Leapfrogging is a developing country's advantage, and in Hyderabad, IT industry almost teleported itself from its analogue and electrical beginnings to the meta-digital world within a short time. As a result, the city saw a sea of transformation in this metamorphosis. This report is an effort to document this transformation, learn from what has been done right, and look into possible future issues that we need to be prepared for.

All governments, past and present, and the bureaucracy have worked seamlessly to further the cause of IT businesses, the ancillary industries needed, and the required world-class infrastructure. Hyderabad consistently being rated as the best city to live in India is a testament to this work.

Hyderabad's emergence as a global city is driven by its world-class academia, research environment, and industry, woven together with enabling policies and enduring support from the government.

With all this effort, Hyderabad today is on the cusp of creating its first set of unicorns. With inclusive growth and development in mind, the catalytic saga of Hyderabad's IT success is being replicated by the government in tier two cities of Telangana.

My sincere thanks to all the stakeholders in this journey of the city's transformation, and I hope to receive the same support in replicating Hyderabad's success in the hinterlands of Telangana.

FOREWORD

Sri Harpreet Singh, IAS
Director General (FAC) &
Spl. Chief Secretary to Govt.

The IT industry accounts for 8% of India's GDP. According to STPI (Software Technology Park of India), in 2020-21 software exports by the IT companies connected to it, stood at ₹ 5 lakh crores. Software exports from Hyderabad is second to Bangalore only. More than 1500 companies are working in Hyderabad employing over 6 lakh people.

MCRHRDI of Telangana has commissioned a Research Project to study the growth of the IT industry in Hyderabad. The Project has adopted a unique ethnographic approach based on interaction with participants who had played a role in growth of the IT industry in Hyderabad. The growth of the IT industry in Hyderabad can be seen from the eyes of technocrats, bureaucrats, entrepreneurs, SME and start-ups.

I hope this study would be useful to researchers and faculty to learn about the policies to be adopted for the development of industrial clusters in states.

I thank Rama Chandra Raju Bhupatiraju and his team who conducted this research and produced this report.

Jayesh Ranjan IAS
Principal Secretary to Government

Information Technology, Electronics &
Communications Department
Government of Telangana

A VISION FOR IT POLICY IN TELANGANA - ENABLING GROWTH AND EMPLOYMENT

Jayesh Ranjan, IAS

Principal Secretary to Government of Telangana, Industries & Commerce (I&C) Department & Information Technology, Electronics and Communications (ITE&C) Department

Since the creation of Telangana, this government has furthered the consistent past two decades of commendable work by the bureaucracy and the earlier governments. The 'Vision-2020' of the erstwhile United Telugu State catalysed Hyderabad's IT revolution. Today, in seven years since the creation of Telangana in 2014, two IT policies of the state: "Telangana ICT Policy Framework 2016" and the latest "Second ICT Policy 2021-26" have almost tripled the state's ITeS exports to over 1,45,000crores and doubled the IT employment to over 6,25,000 people.

The IT Industry of Telangana is envisioned by the state policy to be the key to improving governance. The first "Telangana ICT Policy Framework 2016" envisaged the following broad aspects:

E-Governance, M-Governance, Aligning of Government Schemes with multiple departments, Digital, wireline, wireless and mobile connectivity, Technology Incubators, Development of Electronics Manufacturing, Entrepreneurship, Computer Skilling & Literacy, Citizen-Centric Services. Five years of this policy has more than doubled the IT Industry's volume of business, and today Telangana leads the country in terms of Digital Governance. IT being the stimulator of Telangana's economy, the state has risen to be the 6th largest in India.

Taking the Industry further, Telangana's "Second ICT Policy 2021-26" envisages the four fold path for the state: 1) Fully digital governance interface (unless physical verification is essential), 2) Innovation and Entrepreneurship to be the backbone of the state's economy, 3) ICT as an Industry, by decentralising and drawing IT Businesses into tier-II cities, 4) ICT as a tool for Development (ICTD). Within this four-fold layout, the policy hopes for the following outcomes: Product Development, Engineering and

R&D in IT/ITeS; Developing an Electronics (Hardware) Industry base; Contactless, Paperless, Presenceless Governance, Beyond Digital Infrastructure, Beyond Hyderabad, Digitally Empowered Citizens, Gestating and Proliferating Emerging Technologies. Strengthening the "Second ICT Policy 2021-26" are the following ancillary policies: Electronics (ESDM) Policy, Gaming & Animation (IMAGE) Policy, Rural Technology Centers Policy, Innovation Policy, Open Data policy, Data Analytics Policy, Data Centre Policy, Cyber Security Policy, IoT Policy 2017, e-Waste Management Policy 2017 and the Procurement Policy. The policy environment's targeted outcomes are A) Establishing Telangana as a global hub for product development engineering and R&D; B) Increasing total direct employment in the IT sector to a million jobs; C) Double the IT sector exports to 3 Lakh Crore by 2026.

(Jayesh Ranjan)

D-Block, 5th Floor, BRKR Bhavan, Telangana Secretariat, Hyderabad - 500 022
Ph: +91 40 2345 6401 | Fax: +91 40 2345 0103 | E-mail: secy_itc@telangana.gov.in | jayesh_ranjan@hotmail.com

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This study would not have been possible without the contributions made by the entire team of researchers at the Centre for Development Policy and Practice. Anjana Divakar, Nahia Hussain, Ismail Shaikh and Netheena Mathews worked diligently at various stages to help complete this work. Syed Moin Afroz worked night and day editing and getting the report ready to print. Acknowledgements are also due to the various people who contributed their ideas, suggestions and insights in making this a complete study ready to be used for pedagogical and reference purposes.

The idea itself came from a series of discussions at the MCRHRDI where Mr. Harpreet Singh, DG, MCRHRDI and Special Chief Secretary to the Government for Telangana, Prof. Divya Parmar, Director, Centre for Sustainable Development Goals and Director Admin, Dr. Gautam Pingle, the head of the Centre for Telangana Studies and Prof. Abbas Ali, Head of Management Development Centre met and discussed the need for such a study that would document the growth of a sector that the state has nurtured and developed over the last few decades. It was the insights gleaned from these discussions that enabled us to go forth and seek guidance from the sector experts and policy leaders in structuring the study and presenting the report.

The study would not have been possible without the enormous support we got from J. A. Chowdary, who not only introduced us to an array of contributors but also painstakingly followed each discussion and gave his valuable comments. This was particularly important as the mainstay for the study was these detailed conversations we had with the many stars who contributed to this economic transformation witnessed in Telangana in the IT sector. Various people from the bureaucracy, several politicians, academics and corporate leaders took their time off to give us the historical and the technological context of the growth of IT in and around Hyderabad.

Thanks are due to the various officials at the Dr. MCR Human Resource Development Institute of Telangana, for having given their utmost cooperation in reaching out to the offices of the Hon'ble Minister for IT, various other institutions that we speak to and in ensuring a seamless journey we undertook in preparing this report. It has been a rewarding process in creating a report that is not just the documentation of a policy process that catalysed economic growth in the state, but is also a pedagogical tool that will be used as a best practice documents for the various policy makers and implementers who get trained at the MCRHRDI every year.

ABBREVIATIONS

AP	Andhra Pradesh
ASCI	Administrative Staff College of India
BHEL	Bharat Heavy Electricals
BPO	Business Processing Unit
CCMB	Centre for Cellular & Molecular Biology
CFTI	Centrally Funded Technical Institutes
DRDL	Defence Research and Development Laboratory
DRDO	Defence Research and Development Organisation
EAMCET	Engineering and Medicine Common Entrance Test
ECIL	Electronics Corporation of India Limited
ESCI	Engineering Staff College of India
FDI	Foreign Direct Investment
HAL	Hindustan Aeronautical Ltd.
HITEC City	The Hyderabad Information Technology and Engineering Consultancy City
HMT	Hindustan Machine Tools
HYSEA	Hyderabad Software Enterprises Association
IBM	International Business Machines Corporation
ICT	Information and communications technology
IIIT-H	International Institute of Information Technology Hyderabad
IIT-H	Indian Institute of Technology Hyderabad
INSAT	Indian National Satellite System
INTACH	Indian National Trust for Art and Cultural Heritage
IT	Information Technology
ITeS	Information Technology Enabled Services
L&T	Larsen & Toubro Limited
MCRHRDI	Dr. Marri Channa Reddy Human Resource Development Institute of Telangana

MNC	Multinational Company
NASDAQ	National Association of Securities Dealers Automated Quotations
NFC	Nuclear Fuel Complex
OU	Osmania University
PC	Personal Computers
PPP	Public Private Partnership
PSU	Public Sector Undertaking
SAP	Systems, Applications & Products in Data Processing
SCSC	Society for Cyber Security Council
STPI	Software Technology Parks of India
TCS	Tata Consultancy Services
T-Hub	Technology Hub
TS	Telangana State
UoH	University of Hyderabad
Y2K	Year 2000

EXECUTIVE SUMMARY

Hyderabad's trajectory to its present-day status of being one of the world's leading IT-Hub has been in the making for at least the last three decades. There are three distinct parts of this study. Firstly, the study intends to explore the growth trajectory of the IT industry to bring out any overt or covert models that might have been followed. Insights from the ethnographic interviews of ex-bureaucrats, historians, geographers, academics and IT businesses would be used to explicate these models. Second, from secondary data, the study also tries to understand the international trade in IT and IT services. (The study also looks at understanding the future readiness of the city by getting insights from IT Industry's business leaders). Third, gathering from primary and secondary data, a part of the study also looks into the start-up ecosystem that presently exists in and around Hyderabad.

When one looks at the transformation of the city of Hyderabad from the tier two city that it was up until the mid-2000s, one wonders what and how this transformation took place.

Rich academic discourse on multiple aspects of the city and its change are widely available. Starting from Biao's study situated in the transitioning of the city from the 20th to the 21st century, many studies have documented the social and cultural aspects of the city.

Studies cover this change and transition in specific aspects. The labour aspect of IT around the turn of the 20th century was documented by Biao "Global Body Shopping" (Biao, 2007). Changes in social, cultural, lifestyles, aspirations have been explored in good detail by scholars between the last decade of the 20th century and now (Saavala, 2010) (Fernandes, 2006) (Jodhka & Prakash, 2016) (Lukose, 2009). Change in technological aspects, mainly from a national perspective of India, has been documented by scholars like Dinesh Sharma and Carol Upadhya (Sharma D. C., 2015) (Upadhya, 2016). When one looks for a researched narrative of the city of Hyderabad as an IT-Hub and voices of these narratives of metamorphosis, there is hardly any work that encompasses this aspect of the city's narrative. Scholars like Narendra Luther (Luther, 2012), Dr. Ratna Naidu (Naidu, 1990) have done historical and sociological work. Senior journalist Serish Nanisetty has also documented Golconda and parts of the old city (Nanisetty, 2019). Scholar and Geographer Dr. Anant Maringanti and his Hyderabad Labs have worked on the urban and spatial aspects of the city (Hyderabad Labs, 2021).

A narrative weaving in all these parts into a curated broad story of Hyderabad's transformation to an IT-Hub is something one would not find. The primary vision of this project is to narrate Hyderabad's account of its transformation into a Global IT-Hub. The project also explores the investments that tangentially or symbiotically came along with the growth of IT in Hyderabad.

This study is an outcome of the initiative of the MCRHRDI (Dr. Marri Channa Reddy Human Resource Development Institute of Telangana) in documenting the IT trajectory of the city of Hyderabad. The ethnographic interviews conducted as a part of this project document Hyderabad's IT Trajectory from the 1970s of the events, people and their narratives.

This study was conceived amidst the COVID-19 Pandemic in January 2021. Work continued throughout the 2nd wave of COVID-19 and lasted into the last quarter of 2021.

Making an IT-Hub from a tier two city (which Hyderabad was in the '90s) took an array of competencies and people. This study had to cover a broad cross-section of people that played their roles in this making to get a comprehensive view of the narrative. Bureaucrats, business Persons of billion-dollar companies, start-up entrepreneurs, Indian expatriates, a geographer, a historian, academics, start-up founders were a few people that were interviewed.

The idea of the study was to take all the voices and opinions of interviewees in crafting a composite narrative covering the multifaceted aspects of the city's trajectory. This study envisions itself to be the baseline narrative until now to be looked back, for one to learn about the city's transformation.

Actors in the play

The coming together of elements for the transformation of Hyderabad into the Global IT-HUB started with the liberalisation of the Indian Economy in 1991. The impending globalisation and the Indian economy opening acted as fuel to the fire of the entrepreneurial spirit. The united Telugu state was teeming with engineering talent, which did not have many domestic employment opportunities and started looking out internationally.

Telugu Expatriates

Expatriates looking to give back to the country and create opportunities for their motherland acted as the door openers to these domestic engineers. Due to the impending Y2K Crisis, The USA, UK, Canada and Australia, New Zealand, and most advanced economies in the late '90s had a pressing IT talent crunch. Taking advantage of their education in English, Indian expatriates were highly sought after in the English-speaking world.

There was demand globally, and there was ample and more supply locally, the Indian expatriates bridged these two market factors, and the IT market came to be (Roohi, 2019).

Body Shopping

The formal structures catering to this global demand that came up organically were the 'IT shops' of the day. What Biao, in his study, calls 'Body Shopping' was the first IT product that Hyderabad had to offer the world. Bodies, meaning engineers, were the product. These engineers would travel to far ends of the world to these advanced economies that have mastered computerisation since the 1970s and reprogramme their software, making it compatible with the requirements for the 21st century.

Bureaucracy

Taking this seeming opportunity of a possible technology business wave that was showing up and leveraging the expatriate network of the Techie Telugu Expatriates, the then state government got to explore business opportunities. Of all the things the government knew to regulate, it knew the least about IT and the nuance of that industry. Yet, it set out a team of bureaucrats to explore the possibility of bringing the IT Industry to Hyderabad. A bureaucrat that was an IIT'an was the first person that was assigned to look into this thing called the IT business. Other bureaucrats were assigned to either specially create or enable existing infrastructure to suit the IT enterprises. State policies were dabbled around to suit the needs of the IT businesses. A general infrastructure upgrade was given to the parts of the city where land was marked for the IT businesses. Bureaucrats became solicitors of businesses from IT MNC's abroad. As one bureaucrat would say, "every business that came was a project in itself".

The state catered to almost every need of foreign IT businesses. Special programmes like single window clearances were innovated. Governance got digitally enabled, people could perform the services they needed from the state on the internet; this was India's first e-governance project in India.

The breed of bureaucrats that lead this IT revolution of Hyderabad were go-getters. They did not take no for an answer. When there was a dire need for connectivity, a bureaucrat came up with the idea of a Software Technology Park (STPI). An STPI would enable businesses connectivity to international data networks. This STPI would also be a designated place from where software could be produced and exported like an export promotion zone. Anything and everything in terms of infrastructure that was needed to run software companies was enabled by the government. And it was not the usual enabling that meant things would function for a few weeks or months and thing would fall back to decay. This was a breed of bureaucrats that kept at it to see that what was created functioned, and it functioned like a well-oiled machine.

In coordination with the visionary government of that day, bureaucrats became the catalysts for the IT industry, attaining the criticality needed to become a Global IT-Hub today.

Engineering Education & The Competitive Examination Coaching Industry

In the unified state, there were no more than seven engineering colleges before the mid-1990s. The quality of engineers that these colleges produced was outstanding; after all, the engineering graduates of these colleges were the en-masse first tech emigrants out of India. Furthermore, the graduates of these seven colleges filled the techno/technical/managerial positions in the governments' heavy industries that were set up in Hyderabad since the late 1960s. These graduates, the emigrant engineers in the late 1990s, turned out to be the door openers for the domestic IT talent for body shopping and trans-national technology enterprises.

Engineers are not resources producible in a just-in-time fashion. Production of engineers needed a steady stream of talent that was able to compete. In the erstwhile combined Telugu state and presently too, the EAMCET (Engineering and Medicine Common Entrance Test) was an entry ticket for a high schooler to get an admission into the engineering or medical stream of graduate education. Students and parents laid a considerable emphasis on training for these entrances that has lasted even today. The EAMCET coaching industry sprung up. Though this study did not inquire into that aspect, it can be understood without any uncertainty that an industry which churned out engineers was the 'competitive entrance coaching industry'.

Then comes the story of the exploding number of engineering colleges in the united Telugu state. Licences were liberally given from seven engineering colleges for expanding private engineering educational institutes to at least six hundred. There is no definitive number that this could find because of the lack of information from the department of technical education, but the six hundred number comes from secondary research (Nikhila, 2013). This explosion of engineering colleges has significantly compromised the quality of engineers that have ever since graduated. Today, 80% of Indian engineering talent are thought of to be unemployable (Konepudi, 2019).

Expat Entrepreneurs of the 1990s and Today's Start-Ups

If the pilgrims were the ones that founded America and flagged off the American dream, it is mostly the returning Indian-American expats that moved to America. They lived this American dream, and either

came back or set up businesses back in Hyderabad, that jump-started the IT industry in Hyderabad. Most of these expatriates went to the west as students between the 60's and the 90's for further technical studies after completing their engineering in the united Telugu state.

A vast majority of the IT businesses set up in the 1990s were either directly supported by the Telugu expat entrepreneurs; the expatriates gave technical and or financial backing. This technical backing happened either with the direct presence of the expatriates in Hyderabad or remotely online. As per financial backing, the expats were either the key investors that came back to India or managed the businesses from abroad. More often than not, the Indian part of the businesses they put up was manned either by their families or someone they 'trusted' like friends or ex-colleagues. India was still not out entirely out of the licence raj, though the transformation started in 1991. Wading through some regulations and getting business done was still very tough. Unlike large corporations that can afford to have exclusive staff for compliance, small businesses find it is tough for them to catch up with regulation at times.

The Start-up scene, then and now

Though it was not called one, knowing the background to today's start-ups would be to know that Hyderabad has had India's first incubation centre. This is a sublime fact largely unknown outside the circles of those early entrepreneurs, bureaucrats and enables. The bureaucrat that enabled this was Mr. JA Chowdary, the same gentleman who was the STPI's first chief. While the STPI was set up in Hyderabad at Maitrivanam, Ameerpet, the building contained ample space to house local small businesses (what we call start-ups today) with affordable connectivity, basic infrastructure and access to wings of the government and subsidiaries. This was of great help in the day, aiding smoother customs clearance and helping cut the bureaucratic red tape for the businesses. According to the first director of the STPI, almost all of the start-up's from Maitrivanam have been highly successful. They have either gone to be listed on NASDAQ, acquired and or merged in larger entities.

Now skipping to the time after the formation of Telangana and Hyderabad, Hyderabad also again has probably one the first state-funded incubation centres called the T-Hub for software businesses in conjunction with the IIIT Hyderabad. With the advent of the fourth industrial revolution starting around the second decade of the 21st century, start-ups, unlike earlier being exclusively IT-based, straddle multiple fields and disciplines. The state government has come up with initiatives to develop prototyping centres in association with the multitude of the Centrally Funded Technical Institutes (CFTI's) in Hyderabad.

Y2K: 'The Perfect Storm' which became the wind beneath the wings

There was IT in Hyderabad starting in the late 1960s. There was hardware; there was software; there were the institutions; there was the closed ecosystem of the public enterprise. The one thing that Hyderabad didn't have was the 'market with a critical mass' for the services that it could offer.

The dawn of the internet, which in the 1990s was called cyberspace, opened up the worlds market for IT services to Hyderabad. It dawned upon the world in the mid-1990s that the computer systems of the 20th century followed a six-character dating format in software (mm-dd-yy or dd/mm/yy or yy/mm/dd depending on the country where systems were used). This format assumed the system/software life to end after the 20th century, i.e., on 31st December 1999. All of the world that used computers went

berserk. Amongst the ones that would be greatly affected would be countries that had already embraced computerisation. Fears of armageddon like satellites falling out of the sky, electricity grids collapsing, telecom networks going down, all and every sort of image of things that could go wrong if computers were to stop was feared. Like the sunrise over the international dateline would unfold in 24 hours as the earth rotates, death and drowning of computing systems on the same line as if contemporary civilisation was going to re-enter the dark ages by the time zone was imagined.

Cut that chase and here comes Hyderabad jumping into the scene as the saviour of the world. And what is our secret sauce? It is Hyderabad ability to rapidly ramp up 'bodies' (IT Engineers), deploy them across the planet in these developed economies that needed their systems software to be modified to carry an eight-character date format (dd-mm-yyyy, mm-dd-yyyy, yyyy-mm-dd, again depending on the country where computers were used).

India, at that point, became the world's largest producer of engineers. This was led by Hyderabad and the erstwhile united Telugu state. Many were of the belief that if a high school graduate were not going to join an engineering course, they were socially and culturally considered uneducated or unfit for an education at a degree level. The city and state were producing so many engineers that a government committee recommended a moratorium on increasing engineering seats (U R Rao Committee, 2003).

Indian engineers lead this global effort to adapt the software to work in the 21st century. Hyderabad's IT industry's stepping stone and coming of age in the Global IT scene was its scalability to produce engineers almost on demand in playing saviour of the digital armageddon.

Pre-independence History of Embracing Technology

The erstwhile state of Hyderabad was India's largest princely state. The Hyderabad state that preceded independent India, embraced technology as one of its hallmark qualities. It was one of the first in British India to adopt the railways, the telegraph, telephone and electricity. These technological adoptions catapulted Hyderabad as probably the richest of the 500 odd princely states of the day.

The railways were created to advance global trade of the abundant cotton that was produced. Hyderabadi cotton, which was earlier transported by bullock carts to Bombay with the embracing of the rail, sped up cotton trade from its hinterlands, increasing revenues of the state and its farmers.

Establishing the telegram network between The Residency and Secunderabad Cantonment had created an efficient administration. The next logical step in the advancement of the telegram was establishing the telephone network in the city in the late 1910s and early 1920s.

The state of Hyderabad put up its power generation plant on the banks of its famous lake Hussain Sagar in the 1920s. It was again one of the first cities in the Indian subcontinent to be electrified. This 22-megawatt coal-fired power generation station was one of India's first. The advent of electricity led to the establishment of an industrial estate in the outskirts of Balanagar in the mid-1930s. The Balanagar industrial estate was also one of the first to be a state-supported industrial effort in the subcontinent.

With the coming up of the Telecom networks of the day, good railroad connectivity to the rest of the country, road and air transportation were the fronts on which the city next concentrated. A local and intercity bus network was established, connecting the Begumpet airport in the outskirts to the city. The Begumpet airport, the bus line, and the railroad network were all managed by one authority that

maintained interoperability of transportation. According to historians from INTACH, this was probably one of the world's first inter-operable and scheduled harmonised transport networks.

By the time of Indian independence, Hyderabad was a city of global repute in its own right. The city's ruler, The last Nizam, was the world's richest man not just for a year or two, but the richest man of all times, worth a staggering 236 billion dollars (inflation-adjusted) (Press Trust of India, 2012).

The city went into a lull for the next few decades considering the volatile political ramifications and the intense socio-political and economic changes to the structures of governance that came in with it being incorporated into India.

Hyderabad in the Newly Independent India

The first couple of decades of Independent India saw much political turmoil in Hyderabad. The state experienced a political crisis of being first bifurcated on the linguistic lines and also added to the Telugu speaking regions of the Madras state in the creation of Andhra Pradesh. The Jai Telangana movement took place at the end of the 1960s.

Amidst all this political churning, considering Hyderabad's location in the country from a strategic and security standpoint and its pre-existing infrastructure, the central government started investing in core industry. Defence labs and production were set up around Hyderabad. Research and educational institutes like the Centre for Cellular & Molecular Biology (CCMB), and universities like The University of Hyderabad (UoHyd) came up. Core industries like Bharat Heavy Electricals (BHEL), Electronics Corporation of India Limited (ECIL), Nuclear Fuel Complex (NFC) were set up. This was in sync with the industrialisation of the country that the government wanted to usher in at that point.

People that moved into the city created new neighbourhoods that housed these professionals. Areas like Ameerpet, S.R. Nagar, Vengalrao Nagar started coming up, accommodating these qualified graduate employees. These areas began seeding the social-cultural capital for the city in the form of their children would be second generation graduates that would be bloom to the occasion of the IT boom in the 1990s. It was primarily the children of these first-generation professional migrants to the city, fuelled by the ambition of Indian liberalisation / globalisation in 1991, that became the torchbearers of the IT boom.

1970s

Interfacing technology with the world took a turn southward post the Emergency in the mid 1970s when the license raj came in. The notorious alter-ego of the license raj, the quota system, stifled entrepreneurial spirit. All of this happened in the mid to late seventies. The license raj was stifling that an example given by the interviewees would baffle any of us today. Importing a computer took anywhere from 3 months to three years. One would first get permission to import. Then get foreign exchange clearance. Then place the order. Computers were bulky in the 1970s; they would be the size of an average room or the size of multiple work desks. Considering their weight and bulkiness, with the high price of air freight back in the day, the computers would have to be shipped to a port in India and then transported by rail to Hyderabad. Either at the port of entry or the container collection point in Hyderabad, businesses would have to clear the customs. This process took anywhere from months to years.

A good number of times, respondents told us that the models that would finally arrive in Hyderabad would be outdated by the time they got here. The need for replacement parts was the same saga again. One would need to go through this whole rigmarole and by the time the parts arrived in India, the computers would have mostly died.

To maximise usage, organisations across the city pooled their resources and set up a shared computing centre, which they ultimately moved to the Bella Vista palace to the Administrative Staff College of India (ASCI) located in Panjagutta. This way, downtime was minimised, and usage maximised. Moving computing to ASCI also threw up more avenues for computing to the used. Until the common resource centre moved to ASCI, computing was mainly used for scientific and industrial purposes.

ASCI was a place where the state's administrative bureaucracy was trained. It was the government's internal consulting division to look for solutions to problems. Using Computing in governance started at ASCI.

This was also a time when Hyderabad also lost its first tryst with being a global player in electronics and computing hardware. The reason that respondents attribute was the license raj. Taiwan, which is now the worldwide leader of semiconductor production, was nowhere on the global map back in the 1970s. In retrospect, technocrats of the day think that even with the limitation of policies like the license raj, Hyderabad was very well equipped to have started a semiconductor manufacturing centre, well ahead of Taiwan. But the inward-looking growth model adopted by India between the 1970s and 1991 made it impossible for any international trade or business to happen. If only India and Hyderabad were able to capitalise on that wave, they feel that Hyderabad could have had the same trajectory to being the semiconductor capital of the world like Taiwan is today.

The light at the end of the two-decade-long darkness was the technical employees of these industries, labs and universities that started moving to Hyderabad. Respondents interviewed as a part of this study were people who either worked in Hyderabad at that time, or were graduating students of technical schools. These respondents concur with this narrative that it is towards the end of the 70s and in the 80s that this Public Sector Unit (PSU) employees who wanted more than what their companies could offer in terms of challenge and career satisfaction that started their own small firms in niche computer software or hardware.

1980s

Incorporating any business at the peak of the licence-raj was signing up for trouble and swimming against the tide. Nationwide, the IT Industry's most prominent organisations that persevered this obstacle were Infosys, Wipro, CMC (now TCS), and Hyderabad's very own Satyam Computers (Now called Tech Mahindra).

What happened in Hyderabad in the early 1980s was a fascinating story. IT usage was kindled by a government agency. As noted earlier, due to the import restrictions, frequent breakdowns, lack of replacement parts, and the tediousness of repair, pooled computing was set up in the city at ASCI.

Now a natural outcome of being in the right place at the right time was that the Government considered computing as a tool for administration. This was an outcome of putting government administrators and computers together. One of the first usages of computers for non-industrial and public purposes was the

computerisation of the intermediate exam results. This was probably one of the country's first mass computerisation public administration efforts for its scale of deployment.

The 1980s brought with them the mass consumer computing revolution in the west. After the semiconductor was introduced in the 1970s, the commercialisation of home computers was the next step. Shrinking of the size of computers from the bulky room-sized computers to the size of a CRT (Cathode Ray Television) TV happened in the 1980s. Mass production of computers for home use also occurred in the 1980s. Personal Computers (PC) is what these mini standalone terminals were called. In the west, computers became a household Item. The ability for computer users to create their own software started after the PC. Dial-up connections and home PC data connectivity began in the late 1980s in the west too.

India was watching all these advancements, but neither had the infrastructure nor policies to advance the computing affair taking the world by storm.

Interlocutors of this study tell that the engineering education of the 1980s in the Telugu states was far ahead in quality than anyone could imagine even today. We were told that most teachers were PhDs, and many of them were from the IIT system.

Other than the one odd engineering colleges, which was private, the rest were public-funded. The engineers that these colleges produced were the pioneers of the IT Industry to come in the mid to late 1990s. Computer engineering was only available in the IIT's if someone wanted to take it as an undergraduate course. Being a computer engineer was an unparalleled niche in the 1980s.

Kin Network at Play

An interesting factor to note here would be that the engineering graduates of the 1980s were primarily the children of the earlier generation of skilled employees of the PSU's created in the 1960s and 1970s. For lack of domestic opportunity, many engineering graduates emigrated westward, primarily to English speaking countries. With minimal avenues for further education in engineering or computing, these graduates looked to the west for furthering their higher education. Dominant caste groups, supplemented by their agricultural incomes from their native towns and villages, were the ones that were able to fund their children's foreign higher education. These dominant caste groups ploughed back their socioeconomic capital in the late 1990s to become global door-openers to the graduates of the 1990s, ushering in the Body-Shopping boom (Biao, 2007).

People networks of the 1980s in the new migrant suburbs of Dilsukh Nagar, Ameerpet, S.R. Nagar and Vengal Rao Nagar was the tool that came in handy for Hyderabad to fish for global IT business opportunities. We talk of digital social networking today, but the people-networks of the residents of the new suburbs of 1980s were the seeds that would sow the roots to the IT business boom a decade later.

The 1980s saw the Indian economy hit its lowest growth, stifled by the license raj. Contrasting it to today when we are bombarded by telecom companies to buy a connection, getting a simple telephone connection took years of waiting time. There was no way business would bloom in such an environment. And when India was inching towards hitting the balance of payments crisis, all of the license raj and its red-tapism hit the crescendo.

1990s

The 1990s are akin to the western roaring twenties, a transformation, a complete metamorphosis, a tangential trajectory to what was known until then. IT in Hyderabad started coming of age, surfing on the Y2K and the dot-com boom.

It was the Y2K crisis that made Hyderabad and its IT engineers the poster child of the global IT market. Body shopping meant sending engineers from Hyderabad across the globe to adapt the computer codes written on legacy systems priming them to work in the new century. The crisis was perceived to be so grave that almost any engineer from Hyderabad and India were trained to be deployed by firms across the globe.

The liberalisation of 1991 also helped this cause. Foreign exchange transactions were loosened, import restrictions were cut down. Businesses could solicit and sell their services across the globe with minimal foreign exchange restrictions. Setting up the STPI in Matrivanam, Ameerpet added to the easing of import and export of both equipment and digital services. Affordable commercial business-to-business internet services were kick-started by the STPI by setting up a landing point for satellite internet. Line of sight internet connections were given to businesses from the STPI landing site in Jubilee Hills, next to the present day MCRHRDI. Before this, companies had to have dedicated data lines prohibitively expensive for small and medium businesses to afford.

What people fondly call the 'United Streets of Ameerpet' also came up in parallel with the Maitrivanam located in the same locality. What came up here were hundreds of software training institutes. Any fathomable software was taught in these small training shops that sprung up in shopping complexes and apartment buildings. Right from the most expensive software that cost lakhs to learn in an authorised training centre was taught for a few thousand rupees in these little makeshift institutes. It was not just the cost but also the speed at which the courses were taught. The teaching pace and intensity at these institutes was very intense. For example, basic modules of SAP (Systems, Applications & Products in Data Processing) conducted in an authorised Siemens centre next to the secretariat for 4-6 months were completed at less than one-fourth of the cost and within a month or a month and a half.

Extensive research on the phenomenon of Body Shopping was done by Xiang Biao, an Oxford PhD candidate, later published as a book titled "Global Body Shopping" (Biao, 2007).

The 1990s saw earlier technical emigrants from the 1960s become door openers for and enablers for the budding IT market. Well settled emigrants in technology companies acted as catalysts to funnel their enterprise's offshoring centres to Hyderabad.

The state facilitated important industry and academia bridges by bringing institutions like the Indian School of Business and the International Institute of Information Technology. Today, these institutions rank amongst some of the world's finest institutions.

The 1990s also saw the setting up of one of the first state departments of Information Technology in Hyderabad. This led to the transformation and leapfrogging of the government mindset, which traditionally catered to heavy industry, to take a leap into the digital future. Engineers and IITian bureaucrats were given the posts to head this department. Interviews with the then start-up founders find stories of incredible support they got from the government departments.

In addition to this, the government came out with a 'Vision 2020' plan. A roadmap for the city and the state to achieve new heights. For the first time, information technology parks were set up. The IT business area of town that today is ubiquitously known as HITEC City was made by the state in partnership with L&T. This partnership was again one of the first times the concept of a Public-Private Partnership was used. A natural progression of this was the setting up of the VanBuren IT park, a private tech park, again one of the first of its kind where companies could find ready space for operation.

IT business was starting to trickle in, infrastructure to support IT business began growing, but global visibility for the city was needed to further draw in companies. Two critical instances drew Hyderabad onto the map of the global IT business. One was the visit of the then American President Bill Gates to Hyderabad, and the second was the setting up of the Microsoft development centre in Hyderabad. These events took herculean effort and coordination between the then government and bureaucracy, local IT Industry association, ex-pat engineers, all working together to make it happen.

Once Bill Clinton visited Hyderabad, the world knew that a city called Hyderabad was emerging and ready for the global markets. And when Microsoft was finally persuaded to set up its only other development centre outside North America in Hyderabad in1998, the city had just arrived on the global software market (Microsoft India, 2021).

2000s

With the Y2K opportunity over and the scores of expat engineers flooding the foreign software markets, the next step was to offshore process automation functions of international companies.

Until the Y2K, there was always a question of critical mass that impeded prospective offshoring of IT work to India. Aspects like good schools, infrastructure, lifestyle, entertainment of global benchmarks were not widely available in Hyderabad. Lack of all of those, as mentioned earlier, affected what was called criticality, in simpler terms, the environment required for IT businesses and their employees to thrive.

In the early 2000s, earlier expatriates started returning to India, bringing them the global exposure and training required locally. As the stream of expatriates began increasing, the criticality of Hyderabad's IT business quotient started growing. The dollar conversion rate worked out advantageous for international companies to offshore work to Hyderabad. With plenty of supply of engineering talent, business process outsourcing (BPO) had its run in the first half of the 2000s.

Private tech parks came up catering to almost every need of an IT business. Hyderabad had arrived on the IT Scene by the mid-2000s.

The global financial meltdown and recession of 2008 worked out another wonder for Hyderabad. Against the fear of the IT industry melting down in the heat of the recession, Hyderabad's IT businesses flourished because of the dollar conversion advantage.

America was Hyderabad's most prominent IT market. In the early, to mid-2000s most visas to the USA were issued to people coming from the united Telugu State, than from anywhere else. It became a hassle for businesses to send their employees to Chennai or the other three consulates in Delhi, Mumbai or Calcutta (now Kolkata) for their visas. The US finally decided to open a second consulate in the south of India, with the choice of cities being either Hyderabad or Bangalore. After a considerable tug and tussle

between the governments of Karnataka and the United Telugu state, the consulate was finally set up in Hyderabad. Hyderabad happens to be the first diplomatic office of the USA to be set up in India after Independence (US Embassy and Consulates in India, 2021). This was a real shot in the arm for the IT businesses confidence in the city.

Adding to the already exhaustive set of scientific and academic institutions in Hyderabad, IIT-Hyderabad (IITH) was established in Hyderabad in the year 2008. Today, IITH consistently ranks in the country's top 10 Engineering and Technology institutes and global ranking category of top 591-600 education institutions (Ministry of Education, 2020) (QS Top Universities in 2022, 2021).

The industry started outgrowing the earlier marked out area of the HITEC city. The sector started spreading further west of the city to Gachibowli, and the government created avenues to expand the IT business to the east end of town. Hyderabad had attained criticality and started to flourish.

2010-2014

The early 2010s were a tumultuous time for IT in Hyderabad. The Telangana agitation picked up steam. Both prospective and expanding businesses got caught in a limbo of political impasse. The IT business stagnated in Hyderabad. Until it became certain for businesses whether the united states would remain or split, companies made their bets on Bangalore for expansion and setting up anew.

There was a marked departure of ambition and enterprise of the last two decades in the light of the political instability of the state spitting up.

2014 to The Present Times

Once it became evident that Telangana was to be, IT businesses flooded back to Hyderabad. There has been no looking back at business growth since the creation of the Telangana State (TS) was announced. IT business in Telangana doubled in five years between 2016 and 2021 (Principal Secretary, IT & C Department, 2021).

Telangana (TS) has taken comprehensive planning and policy decisions since its formation in 2014. The state envisioned IT as a thread that binds all of its services to its citizens. TS had come out with a comprehensive ICT policy in 2016 for five years (Secretary. IT, Electronics & Communications, Govt of TS, 2016). A revision of this policy happened in 2021 as a vision for the next five years until 2026. Both these policies have a vision of digital government, Digitally Empowered Citizens, ICT as an Industry and ICT as a tool for development.

Urban infrastructure has exploded in its availability in Hyderabad since the formation of Telangana. Hyderabad has the countries second longest metro network; it has consistently ranked as one of the best cities to live in India multiple times in the 2010s.

One area of IT that Hyderabad severely lacked was and still is, is the start-up environment. In overcoming this shortcoming, T-Hub, a Govt of Telangana tech incubator, was created in late 2015. Today T-hub is on the cusp of incubating a possible unicorn incubated in Hyderabad. On the lines of T-Hub, WE-Hub, India's first State led incubator to promote and foster Women Entrepreneurship, was created. The TS government has started to look beyond Hyderabad for the expansion of the IT industry. It has begun rolling out IT parks in the tier two cities of the state.

The vision of TS shortly is also to become a hardware manufacturing hub.

INTRODUCTION

Dr. Mohammed Abbas Ali

Head & Sr. Prof. Management Development Centre, MCRHRDIT

Today, Telangana State shines brightly from consistently being a perennially backward part of the country. Led by its information technology (IT) and information technology enabled services (ITeS), TS today leads the nation in growth. Registering an average of 12% year-on-year growth, TS's IT exports alone almost tripled from ₹57,258 crores in 2013-2014 to ₹1,45,522 by 2020-2021. This IT/ ITES Exports growth rate is poised to be over two times the national average. Employment in the IT sector has also nearly doubled from 3,23,396 people in 2013-2014 to 6,28.615 in 2020-2021 (Government of TS - IT Electronics and Communications Department, 2021).

Three subsectors of IT, 'IT-ITeS',' Animation Visual Effects Gaming & Comics (AVCG)', and Data Centres (DC) have seen phenomenal growth. Hyderabad has over 1500 IT/ITeS companies and 150 AVCG companies. Given the geographical location, consistent weather and geological stability, it is also a preferred destination for Data Centres in India. The budget for setting up DC and IT Parks that host them is slated to be around ₹8,000 Crores; this investment is supported by a robust 20% annual growth in wireless data consumption in the country (Department of Industries and Commerce-Govt. of Telangana, 2021). Telangana has attracted an investment of USD 21 billion since 2014. The state of Telangana has proactive business-friendly policies like TS-iPass, TS Solar Policy, T-Idea, T-Pride, and its ICT Policy, making it easier for IT businesses to flourish (Dept of Industries & Commerce - Govt of Telangana, 2021). Telangana is also soaring high into the areas of genomics, pharmaceuticals and aerospace. For five years in a row, Hyderabad has been consistently rated as the best city in India to live in by Mercer.

Law and order in the city of Hyderabad has come a long way. Hyderabad and Telangana's legacy of communal tension apart from the maoist threat has become a thing of the past. Leveraging IT, Telangana has geographically distributed command centres for jurisdiction-based command and control focusing on local needs. Cutting edge technologies like computer vision, facial recognition, data correlation, machine learning, geo-spatial analysis have been incorporated to prevent crime and incidents. There have been no significant law and order incidents in Hyderabad since the creation of Telangana. With India's first Public Safety Integrated Operations and Data Centre, Hyderabad's law-and-order situation for the city looks bright (Telangana Today, 2020)

Until recently, almost all of the development of the IT Industry has been in the city of Hyderabad. Distributing growth and development, the government has started investing and creating infrastructure in tier two cities like Warangal, Khammam, Nalgonda and Karimnagar to replicate Hyderabad's success.

Being a tier two city in the 1990s, IT has catapulted Hyderabad's overall growth to today being one of the six megalopolises of the country. The city's business trajectory since the 1990s has led it to become a global hub for IT and related services. With the future of the 4th industrial revolution being convergence, Hyderabad and Telangana have embraced the ushering change by making IT the undercurrent and the core of the state's plans on which all future development shall be woven into.

The CAGR GSDP growth rate of Telangana being over 10.3% puts the state in the top three positions in the country. The 'Telangana Life Sciences: Vision 2030', combined with the state's second ICT Policy 2021-2026, concentrating on Digitally empowered citizens, Digital Government, Innovation and Entrepreneurship, and ICT as an Industry and key for development, Telangana is set to stride into the future leading the way for the country.

This study intends to bring out narratives that have led to the transformation of Hyderabad into an IT-Hub since the late 1960s. This study brings out the stories and narratives of the people that were involved in Hyderabad's transformation.

THE IT INDUSTRY OF TELANGANA

A Literature Review

Introduction

The IT industry has been one of the highlights of the economic growth in India in recent decades, and Telangana's contribution to it has been a major one. The overall economy of Telangana has seen a significant shift in the trends of industrial and economic development due to a variety of economic, socio-political, and historical events. The present study tries to examine the changing economy and the trajectory of the IT industry in India, with a focus on Telangana from 1920 to 2020. The IT Industry has become a multi-billion market over the past six decades. The review also focuses on the growth of the IT Industry in Telangana from being the home to India returned engineers' startups to a global IT hub. The study also illustrates how the evolution of the IT sector in Telangana impacted other sectors such as infrastructure and education.

The academic research in this milieu provides an extensive array of viewpoints and multiple facets. (Narayan, 1950) explores the economic conditions of the Hyderabad state, focusing on population trends, natural resources, and agrarian reforms, which serves as a compendium for further research and understanding the early history of the provincial state. (Shah, 1974) examines India's industrial revolution to reveal a detailed narrative of the composition and state of the industries pre-and post-independence, focusing on industrial development and policy resolutions. (Barnes, 2013) examines the reason for the state's industrial and fiscal support to the IT industry irrespective of its limited impact on economic development, as argued by many scholars. (Hauge & Chang, 2019) assessed the role of manufacturing versus services in economic development which is a well-discussed phenomenon, and it serves as a link in connecting certain aspects of this study. (Ghani & Kharas, 2010) suggested that subsequent growth labelled as service revolution, including rapid income growth, job creation, and poverty reduction led by services, was possible in India and other South-Asian countries. (Menon, 2018) critically observes how statistician P. C. Mahalanobis and Indian Statistical Institute strived to haul India into the computer age by significantly influencing India's Second Five-Year Plan (1956-1961).

An intriguing narrative that has been curated from all these areas of study maps out the nature, state, trends, and demographics of the Indian IT industry, especially Telangana. It also tells us about the existing challenges and opportunities, which are unique and give certain aspects to gauge.

History

The present-day Telangana state was formed as a result of various political movements and struggle over the years. India was ruled by the British empire from 1858 to 1947. Telangana was a part of Hyderabad State before 1947. When India achieved independence from the British Empire in 1947, Hyderabad remained an independent princely state for a period of 13 months. The etymology of Telangana comes from the times of the Trilinga Desha, three temples bordering the then Telugu speaking regions. As a geographical and political entity, Telangana was born on June 2, 2014 after being separated from the north-western part of Andhra Pradesh with Hyderabad as its capital. It is the 29th state and youngest in the Union of India. The history of the state has its origins dating back to at least two thousand five hundred years or more and is unique. There is an essence of Buddhism in its early history. For instance, it was believed that Kondanna, one of the first five disciples of the Buddha, was a typical name from Telangana. The earliest known Buddhist township of Kondapur in Medak district is believed to be named believed to be a typical name after Kondanna. There is also a narrative in Buddhist history that says Bavari, a Brahmin from Badanakurti in Karimnagar (a district in the Telangana state now), sent his disciples all the way to north India to learn Buddhism. In the historical age, Telangana had seen the rule of mighty empires and kingdoms like the Satavahanas, Vakatakas, Ikshvakus, Vishnukundins, Chalukyas, Kakatiyas, Qutb Shahis and Asif Jahis.

Since the timeline of our study is from the beginning of the early twentieth century, it makes sense not to stray with all the components of history but to engage with only those which will serve as the means to a better understanding for further comprehension. The early part of the twentieth century in India was under British rule for almost half of the century. It impacted the Indian economy in many ways, while Telangana experienced a chaotic rule of Nizams before becoming a province, and it's important to highlight the implications of the same.

Telangana before 1920

In 1724, Asaf Jah, the viceroy of Deccan province with the title 'Nizam-ul-Mulk', reclaimed Hyderabad and named the area Hyderabad Deccan. Hyderabad was established as an autonomous province under the Mughal empire. It was the inception of the Asaf Jahi dynasty. Subsequent rulers retained the name Nizam-ul-Mulk and were called Asaf Jahi Nizams or Nizams of Hyderabad. Asaf Jah 1 died in 1748, which led to the political unrest for the contention of his throne among his sons and the neighbouring colonies and kingdoms, and Hyderabad city became the formal capital of the Nizams in 1769.

In 1799, Asaf Jah IV (Nasir-ud-dawlah) signed the 'Subsidiary Alliance' with the British and lost control over the state's defence and foreign affairs. Subsidiary Alliance was a treaty between the British East India Company and the Indian princely states, which required the states to pledge allegiance to the British Empire by losing their sovereignty. This led to the building of the British Empire in India which turned Hyderabad State into a princely state among the presidencies and provinces of British India.

During the British rule or pre-independence period, the state of India's economy was near to stagnation. India was caught up in a vicious circle of poverty due to a low level of savings and capital formation among the countries of the world. In terms of per-capita income and standard of well-being, there was no exception in the performance of the Indian economy. Moreover, the size of the market was limited and did not have further avenues to grow at the time, mainly because of a lack of incentive to invest by entrepreneurs in diversified fields. The Indian subcontinent showed all the signs of an under-developed economy (Kapila, 2008).

Agricultural Economy in the early 1900s

To get a better understanding of the economic state, it is crucial to emphasise the region's occupational structure. India has always been an agrarian economy, with agriculture being the major occupation of most people like most developing nations. Early scholars have conducted various research and investigations with a focus on agriculture to chronicle the development and state of the economy mainly because agricultural activities constituted most of the economic activity. Since Telangana has been a part of such a diverse socio-economic history, mapping out the agricultural state and natural demographics would serve as a yardstick for linkage to the other aspects of our study.

'Agricultural Development in the state of Hyderabad 1900-1956' (Narayan, 1950) is an extensive study done in a similar milieu. According to the 1951 census of Hyderabad, the total population of Hyderabad (of which Telangana was a part back then) was 18.6 million. The classification of people according to their livelihoods showed that 12.7 million were dependent upon agriculture while 5.9 million were engaged in non-agricultural occupations. This equated to 68.2 per cent of the population sustaining agricultural gains. There was a rise in the population trend for both India and Hyderabad between the years 1891- 1951.

As cited in (Shah, 1974), the decade from 1911-1921 experienced a massive outbreak of diseases like influenza, malaria, and plague, and the population trend saw a dip by 6.7 per cent. All other decades ending in 1931, 1941 and 1951 saw a subsequent increase in population. There was a varied composition in the structure of agricultural employment which could be categorised as cultivators of wholly or mainly owned land, landless agricultural labourers and rent receivers. The data depicts that the percentage of rent receivers as well agricultural labourers increased throughout the six decades. (The Census of India, Hyderabad Volume, 1891-1951).

There is no reliable data to map the area under cultivation for the Hyderabad state from 1900 to 1920. The staple crops of Telangana were rice, sugarcane, castor and jowar. In Marathwada (which was a part of Hyderabad state), the major crops were cotton, wheat, groundnut and jowar. Jowar as a food crop constituted most of the area under cultivation amongst the total food crops with 93.55 lakh acres of cultivated area out of 203.90 lakh acres of total area. Other major food crops consisted of rice, bajra and tuvar and moong.

Apart from the food crops, Hyderabad also produced oilseeds, cotton, sugarcane, and other crops. The economy of India and Hyderabad were not regulated in the early decades of the twentieth century due to a variety of events. The first world war had taken its course between 1914 to 1918. The prices of food grains soared during that period and saw a decline in the later decades. Due to the lack of market regulation, information asymmetry and absence of policy measures, there could not be a normal price level for the entire country. (First Five-Year Plan, Summary of Progress, Hyderabad Government).

Industrial Sector

The industrial or manufacturing sector is the backbone of any economy. Nations, whether developed or developing, laid emphasis on the manufacturing sector as early movers or in later stages of planning because it was evident that industrialisation was the means to produce more, generate employment and a way to the overall economic growth and glory. The industrial sector in India has played a vital role in shaping the Indian economy what it is today, making it the sixth-largest economy in the world in terms of nominal GDP and the third-largest in terms of purchasing power parity (PPP). However, the industrial sector has experienced interrupted growth since the beginning of the twentieth century, varying in proportions.

Pre-Independence, most of our industries were light, like cotton textiles, jute textiles, sugar, paper, cement, and some simple engineering industries.

(Shah, 1974) uses the industrial revolution concept to give a narrative of the industrialisation process, its challenges and scope for the future in India. Pre-Independence, most of our industries were light, like cotton textiles, jute textiles, sugar, paper, cement, and some simple engineering industries. Heavy industries like steel were not in great shape, and the steel output was less than one million tonnes. Also, we just stepped into the modern chemical industry. The engineering industry at the time was almost non-existent. Small units manufacturing miscellaneous engineering products and some workshops constituted for what could be called an engineering industry. During the British regime, India did not manufacture even good needles or cycles, and these had to be imported from Japan and the United Kingdom. But the picture has evolved today, the present-day Indian economy has transformed itself into a solid manufacturing nation producing an array of products ranging from pins to automobiles to jet planes. It shows a great trajectory of growth for any developing nation.

The engineering industry at the time was almost non-existent in the city.

In 1947, there was a good deal of pessimism due to the highly unfavourable conjugation of circumstances because of the Independence movement. The country had just emerged from the Second World War during which the manufacture of capital goods within our country was negligible-in fact, the entire requirement of capital equipment for industrial investment, basic raw materials and producer goods had to be procured from abroad. Spurred by fabulous war-time profits, our industries had overworked their plants with woefully inadequate maintenance. Some implications took their course during the partition of India and Pakistan in 1947. With the separation of Pakistan, India's cotton and jute industry experienced a blow when the areas

producing a major proportion of cotton and jute went to Pakistan and Bangladesh, respectively. The time saw industrial unrest, shortage of goods, price inflation, the menacing posture of the Nizam of Hyderabad and other princely states of India, which had to be dealt with in order to have an industrial revolution. (Shah, 1974).

Policy Resolution and Five-year Plans

India as a whole, was not a manufacturing nation. India imported from Japan and the United Kingdom.

After independence, the government's focus to achieve industrialisation on a big scale was through a conscious effort to enhance manufacturing and, thus the economic activity. The government's policy towards industrial development was first introduced in the historic Industrial Policy Resolution of 1948. This policy ushered India into a mixed economy system, which focused on increasing the production of capital goods and intermediate goods. Under this policy, the large industries were classified in four categories viz. strategic industries, basic industries, important industries, and other industries referred to public sector; public-cum-private sector; controlled private sector and private & cooperative sector. This resolution formed the basis of India's First Five-Year Plan. First Five-Year Plan was covered the period from April 1951 through March 1956 which promised a growth in the national income by 11 to 12 per cent.

Formation of the United Telugu speaking Andhra Pradesh-1956

The ending of the First Five-Year Plan is also an important aspect to look at because it is when the formation of the united Telugu speaking Andhra Pradesh took place. The state of Andhra Pradesh (AP) was created on November 1, 1956 with Hyderabad as its capital, by merging the nine Telugu-speaking districts of the old princely state of Hyderabad with the 11 districts of the Andhra state. The latter had been formed on 1 October 1953 by separating the districts from the Madras state. The non- Telugu speaking parts of Hyderabad were merged with Bombay state and Karnataka. (Janardhan & Raghavendra, 2013).

Thus, before 1947, Telangana was part of the Hyderabad state. In 1948, the union government integrated the Nizam state into the Indian union after an armed action known as 'Police Action'

According to provisional totals of the 2011 census of India, AP is the fourth-largest state in India, with an area of two lakh seventy five thousand and sixty eight square kms and a population of eight crore forty six lakhs approximately. The state ranks fifth in terms

of population. It comprises 23 districts: 10 districts of Telangana, namely Adilabad, Hyderabad, Nizamabad, Karimnagar, Khammam, Mahabubnagar, Medak, Nalgonda, Ranga Reddy and Warangal; nine districts of coastal Andhra which are Srikakulam, Vijayanagaram, Vishakapatnam, East Godavari, West Godavari, Guntur, Krishna, Prakasham and Nellore, and four districts of Rayalaseema Chittor, Anantapur, Cuddapah and Kurnool. (Janardhan & Raghavendra, 2013).

With the independence of the India and the bifurcation of the Telugu states the focus of the economy and policy shifted from agriculture to industry

Shift of focus from Agriculture to Industry

During this bifurcation, Telangana experienced this major transformation in geography, population, and linguistic demographics. All this while, India's Second Five-Year Plan was in the making, and it came into existence in April 1956. It led to the revision of a new Industrial Policy in 1956 by revising the Industrial Policy Resolution of 1948. The new policy re-affirmed the freedom of the private sector to develop, subject to certain limitations. (Shah, 1974).

This shift from agricultural to industrial development was crucial to set the next stage for development and progress within the Indian subcontinent and Telangana. There has been a long-lasting attempt to find causalities between the nature of the industry and economic growth. Underdeveloped economies such as India, being an agrarian nation, measured the progress of its economic state through agricultural output. But, with time manufacturing and services sector had also caught up and constituted a significant amount of the national income. The policy resolution of 1948 and the revised Industrial Policy Resolution of 1956 highlighted the government's emphasis on focusing on manufacturing industries' growth.

The Leap to the Services Sector- The Service Revolution

It was also a period when the service industry was emerging and seemed to have a bright future ahead of it. The role of manufacturing versus services in economic development is a subject that many scholars have vastly studied. Many economic development theories have been formed, keeping it a central theme. These pro-industrialisation development theories started emerging in the 1950s and 1960s and became the subject of utmost importance.

However, not long after the publication of 'pro-industrialisation' theories by many scholars and economists, the traditional view of the manufacturing sector as the driving force of economic growth and development came to be challenged. As cited in (Hauge & Chang, 2019), 'Coming of Post-Industrial Society' by Daniel Bell in 1976 was the first attempt to bring up this argument. In the book, Bell put up an argument stating that the wealth of future societies would rely less on the production of goods and more on the provision of services and the spread of a 'knowledge class'.

The services sector was gaining importance in the economic structure of many economies of both developed and developing nations in the latter half of the twentieth century and even more so in the twenty-first century in terms of both output and employment. This trend could be observed in several developed and high-income countries with the rising share of the services sector, the share of manufacturing sector comparatively declined in the contribution to Gross Domestic Product (GDP). (Hauge & Chang, 2019)

The industry growth began from the heavy industry and manufacturing in the early 1960s to 1970s. In the industries was then a slow shift towards to services

India had all the incentives to get on board with the emerging service industry with its rising population and workforce. (Ghani & Kharas, 2010) investigated the idea of a 'Service Revolution'. The study examined that the services industry could achieve growth, employment, gender equality, and other avenues of development. It stated that the services-led industry could be the way ahead for many developing nations, relevant for India and some other South-Asian economies. The share of the services sector in India and other South Asian countries is much bigger than in China, given the country's stage of development. If we compare the growth patterns of India and China, both of which have seen enormous economic growth over the years, the pattern is dramatically different. As a global manufacturing hub and the exporter of an array of manufactured goods, China experienced tremendous growth while India achieved the same by exporting modern services. India has sidestepped the manufacturing sector and leapt straight from agriculture into services. The differences in growth patterns between China and India are striking, and it raised a big question of whether developing economies can directly take a leap from manufacturing to services. The empirical evidence in the study showed a positive relationship between overall economic growth and the growth of services. (Ghani & Kharas, 2010)

Services and Beginning of the IT Industry

This makes evident that services-led growth was sustainable, and the old notions of non-transferability, non-tradeablility, non-scalability of services do not apply to the current context. Services have transformed and moved across borders via the internet and global digitisation. India was not behind in adapting with the services and innovation.

India's first stride towards technology services happened when the Bengali statistician Prasanta Chandra Mahalanobis in the 1940s embarked on a campaign to bring computers to India, at which time India had none. He founded the eminent Indian Statistical Institute (ISI) and was the director of the same. India's first analogue computer was developed in ISI in 1953, and a digital computer was finally installed in 1956. It was the first digital computer to be introduced in India and Asia, except in Japan, which was technologically ahead of other Asian countries. Mahalanobis was a visionary who foresaw the role of computers and technology in planning the development of the state. Mahalanobis and the ISI persistently pursued computers across the world. He tried to harness computers towards creating an idealised economy, the one in which numerical omniscience allowed optimal outcomes. Mahalanobis over the years established himself as a prominent statistician and became the statistical advisor to the government. In 1955, he became a member of the Planning Commission and designed a 'Draft Plan-Frame' which became the template for India's Second Five-Year Plan during 1956 to 1961. (Menon, 2018).

Growth of Service Industry in Telangana

The growth of service industry, especially the IT industry, was one of the cornerstones of the economic betterment in Telangana. However, there have been arguments by many scholars and researchers about the limited development impact of IT industry on the grounds of redistribution of income and wealth and little employment generation for the privileged which was a valid concern. Some of these arguments made sense in the normative sense. The government and other stakeholders in action have looked over these contrasting opinions due to specific reasons. These relate to the ability of the IT firms to utilise existing reserves of skilled workers and the contribution of software services in India's macro-economic stability. IT industry, a significant constituent of the service industry, has been a focal point of the government in enhancing economic activity and is bolstered by

several liberal reforms and policies over the years. These fiscal sops and incentives by the state to the industry created IT clusters such as Hyderabad and Bangalore, which further had huge implications.

NASSCOM (The National Association of Software and Service Companies) was an organisation that was particularly sensitive to criticisms that the IT industry has a limited impact on employment creation. In response, there have been claims that the sector generates substantial direct and indirect employment through backward and forward linkages. As cited in (Barnes, 2013), a study co-sponsored by NASSCOM claimed that every high-tech job translates into about four jobs outside the sector (Gokarn et al. 2007). This claim has been repeated in industry reports (NASSCOM-Deloitte 2008), academic studies (Deokar 2007; Maheshwari 2006) and government documents (Government of India 2007, 2010; OECD 2010). Gokarn et al. (2007) argue that every rupee spent by the IT industry translates into the total output of two rupees in the economy as a whole.

The IT industry in Telangana began to grow and brought about transformation in terms of output generation and employment . New opportunities and perception of employment and emphasis quality and skill education started to see a increase.

The age of service revolution not only bought a considerable transformation in terms of output generation and employment, but it also changed the perception of people and their notions of occupational thought. There was an upcoming wave of opportunities within the service industry. Healthcare, education, financial and banking services were some areas where the forecast of output and employment was shining. Unlike the industrial sector, these new-age services and employment opportunities needed a unique set of skills, where the emphasis was on getting the work done and learning by apprenticeship. A change in education reforms was needed to capitalise on this opportunity. The education industry could cater to this need by incorporating a diverse learning pedagogy in its curriculum, combining theoretical knowledge, skill development, technical training, and other marketable skills.

Considering Telangana's education scenario, it lacked skill-based and vocational education, just like any other Indian state. Skill development could serve as a tool to tackle the challenges common to many high school pass-outs and college graduates in the view of securing decent jobs and choosing career paths. Vocational education was a better pathway for students towards better and more abundant employment opportunities through their specialised knowledge and skillset. An emphasis on the

development of fundamental technical knowledge, occupational information, and vocational training could serve as a better stimulus for learning than traditional theoretical evaluation.

The state of Telangana had certain beginnings in skill development training initiatives in its erstwhile Hyderabad state. Post-integration-and-merger, following the Government of India initiatives on vocational training institutes, ITIs were set up in the combined state of Andhra Pradesh. Further, following the NEP 1986, certain measures were undertaken to introduce vocational education in secondary schools.

For the purpose of enhancing technical education, there was a proactive effort made by establishing several polytechnic and engineering colleges for vocational education and training. Post-bifurcation, the Telangana state now has 289 ITIs. Also, there are 146 polytechnics, 186 engineering colleges for technical education, along with medical (67), pharmacy (119), management (285), MCA (36) and B.Ed. (128) colleges other professional education. (Rao, 2021).

Emergence of IT Industry in India- The 1970s

In the early 1970s, the government's attempts to regulate the IT sector worsened, and India became technologically backwards as Indian computer users preferred using refurbished machines rather than importing newer models (Dedrick and Kraemer, 1993). In response to this, the Bhabha Committee and Sarabhai Committee argued that India should foster an electronics industry that "will have built within it the capacity to pioneer and develop so that dependence on foreign assistance will have been eliminated within ten years" (Yolen, 1977). The committee recognised that foreign electronics firms are necessary. Still, it argued that such ties should result "in the establishment of a definite base for indigenous development and production and obviate further foreign collaboration" (Grieco, 1984). In addition to this, the Department of Defense Supplies had a backlog of over 150 IT project license requests, and the government was criticised for this. As a result, in 1970, the Indian government initiated building a self-reliant electronics industry in the country, the Department of Electronics (DoE), with the recommendation of two Indian electronic committees, the Bhabha Committee and the Sarabhai Committee (Dhar and Joseph, 2019).

The 1970s the BARC argued that India must have and set up and foster a domestic electronic industry independent of foreign assistance.

In 1971, the Electronics Commission was set to lay down policies and guide India's future development. The Central and the State

government highly supported this sector. The Electronics Corporation of India Limited (ECIL) has been in existence since 1967 under the Department of Atomic Energy (DAE), but in 1971 ECIL became a computer manufacturing unit fully supported by DoE (Agarwal, 1984, p.283).

In 1975, the DoE was given the power to license computer imports. With this, the DoE now had the authority and capability to establish control over the development of IT in India. One of the initial steps of ECIL was the establishment of the Santa Cruz Electronics Export Processing Zone (SEEPZ) in Bombay. The primary function of the SEEPZ was to offer Indian and foreign investors incentives to establish an export base in India, including tax breaks, cheap land, duty-free imports of inputs, and a streamlined permit process. In return, the government asked that as much of the Indian components be used and most of the production be exported.

The second order of business by the ECIL was to create state-owned ECIL as a national leader for minicomputer production. To achieve this, ECIL was fully funded by the government, and in addition to this, DoE made it difficult for a private competitor to get operation licenses. This period post Emergency was popularly known as the 'License Raj'. The government's main motive was to permit imports of mainframes and large minis, by giving the small mini market to ECIL and allowing the private firms to compete in the macro sector (Dedrick and Kraemer, 1993). Due to this support, ECIL had 40% to 53% of the market share in India between the years 1973 and 1977 (Dedrick and Kraemer, 1993).

Despite this, the company had two major weaknesses: the company "worked more like a cottage industry", and the company was unable to find a market to sell the product and "by about 1976, it had become obvious that ECIL was not able to meet domestic computer demand with competitive prices and technology" (Brunner, 1991, p. 1742). Due to these reasons, the government decided to open doors to the private sector in the computer industry by announcing the Minicomputer Policy in 1978. This policy allowed companies such as Hindustan Computers Limited (HCL), Operations Research Group (ORG), a subsidiary of Sarabhai Enterprises, a joint venture between Indian firm and the Uttar Pradesh State government, and DCM Dataproducts (DCM), a subsidiary of Delhi Cloth Mills to own a significant share in the market (Grieco, 1982, p.614).

During this time, in 1995, a US computer manufacturing company, Burroughs, entered a joint venture with Tata Consultancy Services (TCS) to export software and printers from SEEPZ (Dedrick and Kraemer, 1993). The third action taken by the ECIL was to challenge the position of multinationals the company, they did by using Foreign Exchange Regulation Act (FERA) which was passed in the year 1973, to pressurise IBM and British-owned ICL (International Computers, Ltd.) to dilute their equity to 40% in their Indian operations. While ICL agreed to this proposal, IBM refused (Dedrick and Kraemer, 1993). After further negotiations with IBM in 1976 and 1977, in 1978, IBM finally decided to exit India altogether.

During the 1970s, there was another primary concern, India was losing its educated workforce to the West, especially to the United States. This phenomenon was known as the 'Brain Drain' (Chacko, 2007). Meanwhile, Hyderabad became home to numerous heavy industries in the public sector, which were set up during the 1960s and 1970s (Ramachandraiah and Prasad, 2008). The location of these industries resulted in several employment opportunities, which led to the in-migration of skilled workers and their families to Hyderabad. Due to this, Hyderabad had witnessed a massive influx of people searching for better living conditions and opportunities from the surrounding districts. (Ramachandraiah and Bawa, 2011).

The 1970s also witnessed a phenomenon of 'Brain Drain'.

In the mid-1970s, post-emergency, it became challenging to import computers when the license raj came in. It took around three months to a year to import the computers. By the time they reached the customs, the computers were outdated. Getting the new replacement parts, which were expensive combined with the international transportation charges back in the day, was an extensive process. In addition, importing the parts would again take the same amount of time. Due to this, companies across the state pooled up their resources and set up a shared computing center in Bella Vista for their Administrative Staff College of India (ASCI) in Panjagutta. ASCI soon became a place where the state's administrative bureaucracy was trained.

The Era of IT Exports and Partial Liberalisation - The 1980s

Despite the unceasing efforts of the government, India was still technologically backwards. India's IT policies in the 1980s were aimed at modernising the IT industry that was estimated to be

about 15 years behind the current frontiers of research and production (Girdner, 1987). In the early 1980s, some liberalisation and trade took place, but there was no relaxation of the FERA restrictions on foreign investments (Dedrick and Kraemer, 1993). These government restrictions were considered as an advantage to the IT industry in Hyderabad, being at the right place at the right time; with the setup of ASCI in the late 1970s, the government considered computing as a tool for administration. During the same period, Personal Computers (PC's) were invented. The trade and investment liberalisation policies primarily impacted the development of the IT industry in the early 1980s. The IT industry experienced a temporary boost in 1984 when then Prime Minister identified telecommunications and information technology as a "core sector," together with traditional industries such as electrical power generation, steel, oil, and automobiles (Wolcott and Goodman, 2003).

Two new policies were announced later that year: the New Electronics Policy (NEP) and New Computer Policy (NCP). The main objectives of NEP were facilitating technology transfer in the electronics industry, importing computers for government departments, establishing 'science cities and science parks' to encourage expatriate Indian technicians to return to the country, and setting up free-trade export processing zones. The NCP was announced by DoE and their main goal was to remove the institutional barriers for "transforming the IT industry into a 'virtuous circle' competitive prices/costs-higher demand-higher scale of production-higher efficiency-competitive prices/costs'. This marked a departure from the erstwhile policy that restricted entry of companies that were a part of 'monopoly houses' (Dhar and Joseph, 2019).

During the 1980s policies to support the IT and electronic industry were coming up. Such as the New Electronics Policy and the New Computer Policy.

Later, in 1986, DoE announced The Policy on Computer Software Export, Software Development and Training. This policy facilitated the growth of the software industry. The policy underlined five key objectives: (i) software exports to achieve a quantum leap and obtain a sizeable share of the global software market; (ii) to target an integrated development of software for national and export markets; (iii) simplification of procedures to accelerate the growth in the industry; (iv) establishment of a firm base within the national software industry; and (v) increased utilisation of computers in decision-making and enhancing efficiency (Lakha, 1990, p. 49). According to Dr Seshagiri of DoE, the policy was a "flood-in, flood-out strategy" which meant

that at the beginning, there would be a flood in imports, resulting in an even greater flood out of exports software services (Dedrick and Kraemer, 1993).

In 1988, NASSCOM (The National Association of Software and Service Companies), a non-government organisation, was founded. NASSCOM played a vital role in establishing a brand image for India in the global software services market by participating in international trade fairs, events and organising learning events in India that featured experts from significant markets. (Bhantnagar, 2006).

Liberalisation and Economic Reforms- The 1990s

Liberalisation in India brought a massive influx of opportunities and scope for the services industry, especially IT. The software technology parks (STPs) in 1990 by the DoE (Barnes, 2013). These parks provided software exporters access to free water and electricity. Wholly export-oriented firms were given additional benefits such as tax-free status and duty-free purchases of capital imports. Due to establishing these parks, India had seen a rapid increase in the number of software firms, from 50 firms in 1986, to over 140 firms by the end of 1990. Few companies relocated to Special Economic Zones (SEZs), which became individual STPs (Pinglé, 1999, p. 141).

The LPG reforms opened up the software market of the country to the world. India started to receive foreign investment and opportunity

The economic reforms of 1991 had a significant impact on the Indian software sector. Now, the software firms that found it difficult to finance their firms through debt due to the lack of collateral could raise resources quickly through equity. Although the 1991 reforms signaled that India has become receptive to foreign investment, low fixed costs, export orientation, India's comparative advantage led many Multinational Companies (MNCs) to open their branches in India (Kapur, 2002).

In 1994, wages for software programmers and systems analysts in India were less than one-tenth of those for their US counterparts. It was comparatively lower even than other developing countries such as Mexico. Indian programmers also had the unanticipated advantage of familiarity with the Unix operating system in the 1990s. Computer manufacturers in India in the 1980s had no alternative but to rely on Unix (the first portable, machine-independent, multi-user operating system) even though foreign companies were developing proprietary systems at the time. But this turned out as an advantage for them as by the 1990s, when Unix became the system of choice for personal computers and

workstations, Indian Unix programmers had a skill that was extremely rare to find anywhere else in the world (Saxenian, 2015). The Indian software firms have grown from 430 in 1996-97 to over 620 in 1997-98 (NASSCOM, 1996-97,1997-98). By 1999, over 95 MNCs in India, 70 entered India after 1990 (Kapur, 2002).

The educational institutions saw a rise in engineering colleges offering computer science from 30 to 107 in the period between 1990- 1995.

Liberalisation in the 1990s also had a massive impact on Telangana. It began with the IT Industry's origin in Hyderabad in 1990 in Maitrivanam, which was also India's first IT incubator. It was due to the Y2K making Hyderabad the poster child for the global IT market. In 1992, the Hyderabad IT hub moved from Maitrivanam to Madhapur. From 1990 to 1995, the number of engineering colleges that were offering computer applications in Andhra Pradesh has gone up to 107 from just 32, and 30 new engineering colleges were added shortly after, to keep up with the growing demand of the IT industry, especially software in the country (Kapur, 2002). The state's GDP was far below the national average in 1995- 1996 as the state government's expenditure on warfare and subsidy comprised 10% of the state GDP (Y.V. Krishna Rao et al., 2002). To help the state from the crises, the then Chief Minister utilised the liberalisation policy to reform the state economy (Naidu and Ninan, 2000). This was done by attracting foreign investments to Andhra Pradesh for various banking and finance, biotechnology, and information technology industries (Das, D., 2015).

The next mission of the government was to turn Hyderabad into an engine of growth (Kennedy, 2007). This was achieved by initiating a USD 350 million erudition enclave called HITEC City (Hyderabad Information Technology and Engineering Consultancy City) (Das, D. 2015). Soon after, in the year 1998, the first phase of HITEC City, the 'Cyber Towers', was inaugurated. The Cyber Towers was the headquarters of numerous multinational IT companies. Hyderabad soon became an international hub for the IT industry and was later known as India's 'Software Training Capital'. This growth was majorly due to the Information and Communications Technology (ICT) Policy, as this was the time when there was a vast supply of cheap labour and high demand for an educated workforce from leading national research and academic institutions. In 1998, the country's first department of information technology was formally established in Andhra Pradesh to exclusively focus upon information technology and give the sector the impetus it deserved.

Software Technology Park (STP) in Telangana, Their Role and Composition

Software Technology Parks of India (STPI) is an autonomous society established in 1991 by the Ministry of Electronics and Information Technology (MeitY), the Government of India, to enhance and uprise software exports from the country. These tech parks provide the necessary infrastructure and building assets for usage administration. The aim of these parks aligns with the advancement of IT/ITeS industry, innovation, R&D, aiding the start-ups, creating technology assets and products in the field of emerging technologies like IoT, blockchain, Artificial Intelligence (AI), Machine Learning (ML), computer vision, robotics, Robotics Process Automation (RPA), augmented & virtual reality, animation & visual effect, data science & analytics for various domains like gaming, FinTech, agritech, medTech, Autonomous Connected Electric & Shared(ACES) Mobility, ESDM, cyber security, industry 4.0, drone, efficiency augmentation, etc. (STPI Portal).

The objective of STPI is the development and promotion of exports relating to software services, information technology and ITeS. STPIs have provided data communication services and various other value-added services to IT and related industries. These parks have also contributed to providing statutory and other promotional services by implementing schemes formulated by the state. These statutory services include the Software Technology Park (STP) conspire and the Electronics Hardware Technology Park (EHTP) plot to advance the ITeS industry. STP Scheme is an interesting plan intended to advance the software business and development of new companies and SMEs with no locational imperatives. At present, more than 3,800 units are enrolled with STPI. During the FY 2016-17, IT/ITeS send out made by STPI enrolled units are ₹ 3,50,680 crores and electronics hardware fare of ₹ 8,554 crores under EHTP conspire. Promotion of micro, small and medium enterprises (MSME) and boosting entrepreneurship is also a significant role in STPI's mission and vision. (Yadav & Lal, 2021).

STPI Hyderabad was started in 1992 with 11 STPI-registered units operating from the main complex and 6 operating from outside. STPI Hyderabad is one of the ten STPI jurisdictions having its main centre in Hyderabad, Telangana and five sub-centres located at Kakinada, Tirupati, Vijayawada, Visakhapatnam, and Warangal. The centre has been the major

STPIs have provided data communication services and various other value-added services to IT and related industries.

constituent for the growth of the software and hardware industry in the combined Telugu states and now in Telangana for the last three decades. This establishment has enabled Hyderabad to emerge as an IT hub in India. STPI-Hyderabad has warranted the growth of software exports from Telangana & Andhra Pradesh region and created multitudes of opportunities by buoying the economic progress. During 2020-21, STPI-registered units under STPI-Hyderabad jurisdiction contributed ₹72,457 crores IT/ITeS/ESDM exports.

Y2K and The IT Rise in India - The 2000s

In the year 2000, the Indian IT industry was worth over ten billion dollars, of which the hardware industry owned two-thirds of the market and the rest one third was owned by the software industry

The Y2K (the year 2000) glitch had a significant impact on the Indian IT industry. In the year 2000, the Indian IT industry was worth over ten billion dollars, of which the hardware industry owned two-thirds of the market and the rest one third was owned by the software industry (Computers Today, July 1-15, 2001). In the early 2000s, there was a significant spike in IT startups owned by the middle class in India's major cities like Bangalore, Pune, and Hyderabad. The growth rate of the IT industry declined sharply in 2001-02. IT Industry sales grew only by 23.1%, raised by a 63.9% growth (from a small base) in IT-enabled services; software sales increased 21.7%. Development of domestic sales fell even more drastically to 10.7%. These declines are partly due to a fall in charges for services; the real growth has been higher than these figures suggest. But there has been a slowdown even in absolute terms; the almost complete cessation of campus recruitment in 2002 is one indicator (Desai, 2003).

A survey conducted in 2002-03 among small and medium-sized software companies in Bangalore (Upadhya, 2003) revealed that almost all founders were from the middle class. Still, they were highly educated professionals with years of work experience to back them up. The rest came from business communities and others who had trapped 'old economy' capital to start their businesses (Upadhya 2004a).

And soon after, in the late 2000s, many Indian IT firms started marketing themselves based on their ethical standards and cultural values alongside their technical expertise and labour cost differential. These ethical and cultural standards were popularly known as the "traditional middle-class values" (Upadhya, 2003).

"The new millionaires did not inherit wealth. They have risen on the back of their talent, hard work, and professional skills" (Das 2002b: xv-xvi). In 2005, India owned 3.3% of the market share for the global market for outsourced IT services. This was close to

half the stake held by Fortune 500 companies, and in addition to this, India's market share stood second in terms of share position after the United States (Bhatnagar, 2006). The NASSCOM membership grew from 38 members in 1988 to over a thousand firms in 2005 (Bhatnagar, 2006).

The Y2K had not only a significant impact on India but also Hyderabad. The problem helped open the world markets to Hyderabad. Hyderabad was soon dubbed the 'Silicon Valley of the East' by Bill Clinton during his visit to South India in 2000. In the early 2000s, the education infrastructure in Hyderabad was closely integrated with the IT and Information Technology Education Services (ITeS), the economy that has constituted nearly 99% of the state's exports for the past five years (Government of India, 2010). By the end of 2000, Andhra Pradesh had 96 engineering colleges offering computer-related courses, 469 colleges (excluding the engineering colleges) offering Bachelor of Computer Application (BCA) degree courses, and 161 offering Master of Computer Applications (MCA) (Xiang, 2011). A total of 100,000 students in the state were enrolled in the IT or IT-related courses in 2000-2001 (Xiang, 2011). The sole purpose of all these courses was emigration to the United States, and the curriculum for these courses was specifically designed according to the American need. It was adapted from American textbooks (Biao, 2007).

The Y2K problem helped open the world markets to Hyderabad

IT Policy and Electronics

In the late 1990s, the then Chief Minister of Andhra Pradesh formed a Special Interest Group comprising government officials and officers from the nascent local IT industry. The group's main recommendation was to formulate a new IT policy for the state. Before releasing the policy, the government officials looked at the information and communication technology sectors in developed countries as models. After further research, the mechanism of Citizen's Charter, which helped in applying the International Standardization Organization's (ISO) standards to the British government, especially from the perspective of providing services to consumers, was considered most applicable from Andhra Pradesh (Dabla, 2004). In 1999, the Vision 2020 policy was released to define the vision for Andhra Pradesh. The main aim of this policy was to improve the lives of citizens by using IT to promote employment, electronic government services, education, and economic well-being.

In 1999, the Vision 2020 policy was released to define the vision for Andhra Pradesh. The main aim of this policy was to improve the lives of citizens by using IT to promote employment, electronic government services, education, and economic well-being.

The Andhra Pradesh First Information Technology Policy 2000 was the first official policy catering solely towards the IT sector and was released in 2000. This policy aimed to make the state globally competitive in the IT sector and cultivate strategic collaborations with other countries. In addition to this, the objective of this policy was to use IT to foster economic development in the state, and this was achieved by the growth of the IT industry in the state along with software exports, more employment opportunities, the attraction of foreign investments, high-quality services and by promoting knowledge as the critical resource for the economic progress of individuals and institutions. In 2002, a new Information and Communication Technology Policy, 2002-2005, was released, which was to be effective till 2005. This policy aimed to attract foreign companies and promote private IT companies in the state (Dabla, 2004).

The government wanted to bring its citizens a 'SMART' government – a simple, moral, accountable, responsive, and transparent government.

The electronic sector was the third primary sector promoted by the IT policy. Andhra Pradesh government wanted to bring its citizens a 'SMART' government – a simple, moral, accountable, responsive, and transparent government. This was achieved by decentralizing planning and admissions, revising performance evaluation mechanisms at all levels of the government functions and integrating services provision with IT. The state tried to use all its IT resources to usher in electronic government by designing a framework for Public-Private Partnership (PPP). To enable PPP, the state planned to create suitable applications, initiate proposals for electronic government services, and then open the bidding process to information technology companies. Companies that won contracts could then collect user fees for the electronic government services they provided under this mandate (Dabla, 2004). Between the years 1994 to 2002, various government programs were implemented such as:

(I) Computer-Aided Administration of Registration Department (CARD) in 1998, its functions were the registration of documents; valuation of immovable properties; a collection of revenue stamp duty, transfer duty and registration fee; preservation of copies of documents; issuance of certified copies of document s and encumbrance certificates; and registration of societies, firms, chit funds, non-trading companies and marriages.

(ii) Multi-purpose Household Survey (MPHS) in August 1998, and the objective of this program was to computerize operations at the pivotal field unit of administration,

namely at local revenue offices; create databases on socio-economic information of all citizens of the state; create details of all agricultural landholdings in the state; create a unique ID for each citizen; and issue various certificates relating to land and socio-economic status of citizens.

(iii) eSEVA in 1999, aiming to provide efficient services to citizens in an integrated manner.

(iv) Fully Automated Services of Transport Department (FAST) in May 2000. It focuses on improving services to the citizens by issuing learner licenses, driving licenses, tax tokens, permits and international driving permits; renewing driving licenses; registering vehicles, and endorsing purchase agreements.

(v) Andhra Pradesh Network known as MANA TV (APNET) in October 2000. Its goal is to develop an information technology infrastructure for social development in the state.

(vi) And Saukaryam, through PPP arrangement, enables Vishakhapatnam to deliver a host of civic services such as online payment of municipal dues, payment of trade license fees, advertisement charges, building license fee and other registration charges (Dabla, 2004).

Partition of Andhra Pradesh and Uncertainty- The 2010s

Andhra Pradesh was ranked fourth for its share in software exports in the IT sector in India, and it owned 15% of the market share by 2010. Fortune 500 companies such as Microsoft, Infosys, Tata Consultancy Services (TCS), Capgemini, Amazon, Google, etc., started their operations in India. The IT parks and Special Economic Zones (SEZ), which were situated in Madhapur, expanded to various areas in Hyderabad, such as Nanakramguda, the Financial District and Gachibowli (Prathyusha, 2019). In addition to this, the early 2010s was a difficult time for the IT industry in Hyderabad as the agitations of Telangana picked up. Until it was inevitable for business if the state would be united or split up, many companies began operations from Bangalore. The IT Industry, which was booming till then, had come to an unexpected halt. In 2014, the state was finally split into Telangana and Andhra Pradesh. And now Hyderabad, after being the joint capital of both the states, was

The IT industry generated employment to 43,417 professionals in one year, taking the total number of employees from 4,31,891 in 2016-17 to 4,75,308 in 2016-17

The IT industry's state exports achieved a healthy and impressive growth rate of 9.32%, better than India's IT industry's national average of 7-9%.

State IT sector exports accounted for approximately 49% of all sectors' total exports. In 2018-19, Telangana State's position was second in the country in terms of total revenues from the IT sector

soon the capital of Telangana. When it was made sure that the state was bifurcated, IT companies started flooding back into the city. The IT industry generated employment to 43,417 professionals in one year, taking the total number of employees from 4,31,891 in 2016-17 to 4,75,308 in 2016-17. The IT industry's state exports achieved a healthy and impressive growth rate of 9.32%, better than India's IT industry's national average of 7-9%. State IT sector exports accounted for approximately 49% of all sectors' total exports. In 2018-19, Telangana State's position was second in the country in terms of total revenues from the IT sector (Telangana IT Department Annual Report 2016-17).

The Andhra Pradesh government saw a significant benefit of promoting the IT industry in the state. The sector needed technically skilled labor, which led to higher education institutions that provided technical education and training. Due to the growing demand for technical education and the magnitude of the task involved, the state felt it could undertake all the interventions required on its own. Hence, it decided to encourage private investors to partner in its effort. Soon, the State Board of Technical Education and Training was constituted to give adequate control over the maintenance of quality and technical education standards and promote and coordinate training services. This phenomenon resulted in compulsory computer education for all degree-granting colleges from 2003-2004. Two new degrees were introduced to keep up the demand: a bachelor in Computer Application (BCA) and Bachelor in Business Management (BBM). In addition to this, two technical higher education institutions were created with the aid of the state: The Master of Science in Information Technology Program (MIST) was set up in collaboration with the United States-based University- Carnegie Mellon University and the local IT companies. MIST aimed to groom and prepare IT professionals to gain employment in the IT industry and take up entrepreneurial ventures. IIIT (International Institute of Information Technology) Hyderabad aims to train engineers at undergraduate and postgraduate levels, help them with advanced research and development in the information and software technologies, and work closely with IT companies for employment opportunities for their graduates (Dabla, 2004). In the academic year 1994-1995, there were 32 engineering colleges and 9335 students, and in over a decade, from 2001 to 2005, there was 245 engineering colleges education over 70768 students (Sudan, 2001).

The sector needed technically skilled labor, which led to higher education institutions that provided technical education and training

The success of the IT industry in Hyderabad was due to the local collective. The Hyderabad Software Enterprise Association (HYSEA), a city-based IT company collective that facilities the industry to interact with the government and global players, is the only regional body in India. The rest of the states have NASSCOM. HYSEA accounts for 10% to 15% of the total number of IT companies in the cluster (Gulati, 2012).

Contribution of IT Sector in Employment Generation

The tertiary sector has played a significant role when it comes to employment generation. The entire service revolution changed the course of India's industrial structure and brought along multitudes of opportunities in terms of employment, equity, and overall enhancement of the state and its people. This recent transformation of IT as a mass employer has undoubtedly uplifted the aspirations of the middle-class.

The Business Process Outsourcing (BPOs) in India began in the late 1980s by British Air and American Express for back-office operations

The Business Process Outsourcing (BPOs) in India began in the late 1980s by British Air and American Express for back-office operations. Soon after, in the 1990s, a new milestone was achieved with the entry of GE as GE Capital International Services (GECIS) by opening low-cost service verticals. This became a massive success in a short period, which resulted in creating a separate legal entity in 2004 called GENPACT. By the end of the 2000s, the Indian ITeS/BPO companies were offering services such as finance and accounting, knowledge services, customer services, human resources, and procurement for a wide variety of sectors such as telecom, manufacturing, healthcare, retail, media, and utilities. India, in the present-day, owns over one-third of the global BPO market. This is achieved by creating business value from captive and third-party service delivery to service optimisation, access to talent, productivity, and new business facilities for skill and knowledge cost arbitrage. The diversification in the sector had helped build its capacity to offer process and knowledge-based solutions for a specified industry or vertical. This rapid growth has resulted in both a high turnover and labour shortage at the same time. This provided employment opportunities to a new generation of graduates. Global giants were attracted to India for its quality services and affordable workforces, such as Apple, WNS, Infosys, TCS, and Wipro. In the Indian market, Genpact, TCS BPO, Wipro BPO, Aegis BPO, WNS Global Services, Firstsource Solutions, IBM Daksh, Aditya Birla Minacs, Infosys BPO, Accenture India, HCL BPO would lead the market including few more and hold the significant share of the business (Sheth and Singh, 2012).

BPO's have employed 7 lakh people in India since 2000.

The inception of BPO and Information Technology Enabled Services (ITeS) industry in the early 2000s was the coming-of-age event that encouraged innovation and employment generation.

BPO's have employed 7 lakh people in India since 2000. Meanwhile, cities like Bangalore and Hyderabad emerged as hubs for the BPO services with an influx of people from all over the country searching for jobs.

The BPO/ ITeS industry has been known by different names throughout its course of existence. It began with the popularly known name as the 'Call Centers' in 1999. Later, BPO caught up, which included both backend office and call center work. Eventually, Knowledge Process Outsourcing (KPO) emerged, which was the outsourcing of information-related business processes.

This type of work can be carried out by the subsidiary of a company or any different company altogether. These companies could also operate in other countries or offshore locations to save cost and avail cheap labour. Most recently, the abbreviation BPM (for Business Process Management) is commonly used, and customer-facing businesses are sometimes referred to as contact centres.

BPOs have enabled companies and their employees to operate and function cross-border with efficient use of the latest technologies such as high-speed telephone lines, the worldwide web, and satellite communication. Recently, consumers' shift to new technology platforms like mobile phones and tablets has lent greater importance to apps, text messages, and artificial intelligence. (Mankekar & Gupta, 2017).

The employment from the IT industry was not only confined to the BPOs, but it also had other components like packaged software products, engineering services, R&D, product development, hardware, e-commerce etc. In their different capacities, these components contributed to the employment and output generation over time. For a long time, India remained an exporter of services and cheap labour. With a mass population and increasing number of graduates every year, there was a solid lot of workforce in place, eager to be employed. With the aid of state-promoted bodies and other professional institutes with advanced curricula, it enabled a competent workforce of IT/ITeS trained graduates and professionals.

As cited in (Barnes 2013), a survey of over 6,000 IT firms sponsored by the Reserve Bank of India concluded that 77 per cent of export earnings came from 'computer services' and 23 per cent from 'ITeS/BPO' firms (RBI 2009: 1519). NASSCOM claims that employment in the IT industry grew by eight times between 2000 and 2009, reaching about 2.2 million. It has also been claimed that the industry has generated indirect employment for around 8 million people (Government of India 2007, 2010; NASSCOM 2010).

BPOs have enabled companies and their employees to operate and function cross-border with efficient use of the latest technologies such as high-speed telephone lines, the worldwide web, and satellite communication

Present-day Scenario and Entrepreneurship- The 2020s

By the beginning of 2020, Hyderabad was recognised as one of the leading IT hubs globally. It was home to over 1200 IT companies, including startups, small, medium, and large firms, which combined, employed over 4,50,000 IT professionals, supporting indirect employment of over 7,00,000 people. For the development and promotion of the IT Industry in the state, the Andhra Pradesh government announced the Information and Communication Policy (ICT) in 1999, 2002, 2005 and 2010. After the separation in 2014, the Telangana government declared the ICT policy 2016 at the Hyderabad International Convention Center (HICC). The main objective of this was to make "Telangana the most preferred technology investment destination in the country" (ICT Policy, 2016).

Telangana government declared the ICT policy 2016 at the Hyderabad International Convention Center (HICC).

In the present times, with the rise of the entrepreneurial wave across the globe, any assessment made for measuring growth would be incomplete without taking into account the role of startups and entrepreneurship. Schemes like 'Make in India' have encouraged innovation and self-belief among small business owners. Engineers, technology experts and people from several domains are proactively coming up with new products and services which show remarkable potential. These innovations in the form of technological assets, services and platforms have also rendered of utmost use in government and state administration. With global digitization, several e-governance initiatives have come up in recent years, making both administration and consumption of services easier. This new direction towards innovation and creation has been made viable with efficient adaptation to technology.

The roots of this entrepreneurship foundation were planted in Hyderabad in the 1990s with LPG and direct government incentivisations.

The two metropolitan cities have adapted to this trend better than others namely Bangalore and Hyderabad. The roots of this entrepreneurship foundation were planted in Hyderabad in the 1990s with liberalisation reforms and direct inducing factors such

as the government's industry and infrastructure policy, the establishment of research institutions and immigration of talent. All these factors along with the positive responses from market forces made Hyderabad a modern industrial cluster which later transformed into an IT cluster.

There was an emergence of triple helix model in Hyderabad, similar to that of Bangalore, which had government, industry and academia working together. All this gradually led to the nurturing of different components of entrepreneurial ecosystem for the startup scene in Hyderabad. This triple helix model consisted of a nucleus comprising technology startups and prospective technology startups, surrounded by the existence of indispensable factors (finance, market, human resources, support systems, and mentors), and supplementary factors involving supportive culture and media. (Subrahmanya, 2017)

Covid-19 had a widespread impact on economic activities globally. IT sector has become the most prominent internal function in the aftermath of Covid-19, with business and other functions expecting IT services and support like never before to adapt to this normal. Indian IT firms did not have the adequate infrastructure to deal with a covid-like situation; therefore, they had to set up covid response teams and come up with action plans to navigate through this crisis.

(Ramasamy, 2020) in his paper tried to map out the different challenges faced by IT companies during the covid pandemic by collecting data from IT professionals and using a sampling technique. The outcome of the study highlighted some common points pervasive in all IT companies. Productivity of the employees was affected at a large scale, and some of them were not honest and genuine in their working patterns. It was found that not all employees were capable of working on their own and needed supervision. In foreign countries, people were aware of the work from home model, and they have been practising it for some time now with proper infrastructure, but the readiness level in India is very different.

The biggest challenge that came across was the setting of the work from home model with proper infrastructure for each employee. IT companies had to provide laptops and other devices, ensure proper bandwidth and power backup for avoiding availability issues of the employees. This sudden shift resulted in an additional financial burden on organisations. The financial burden

also increased because of the fixed costs like rent of the vacated buildings these firms had to bear. Firms saw a delay in deliverables and projects because of work from home model; this affected the IT business severely as new clients would not easily sign up due to inefficiency. (Ramasamy, 2020)

Another similar study was conducted by (Singh & Kumar, 2020), which tried to explore the emerging trends and impact of the pandemic caused by novel coronavirus on working professionals of the IT sector in Bengaluru. The first objective of the study was to analyse the working culture, and it had some startling results. Employees were spending more time working from home than in the office, and yet most of them were able to maintain a healthy work-life balance.

Some employees also felt insecure about the future of their jobs due to the economic downturn that covid- 19 bought. The market saw a decline during the pandemic and many organisations resorted to salary cuts for their employees. The study also highlighted that there was a communication gap between the employees as virtual and video conferencing tools were not as effective as real-time meetings and interactions. The organisational culture and values took a hit in this WFH model, and employees faced psychological stress due to this sudden change in the ambiguity of the working process and job security.

The study also examined the emerging trends due to wider acceptance of work from home. The aspects covered and the results were different from the previous study. The study highlighted that the employees were able to save the time of commuting by working from home, and they preferred a hybrid model of working where they were given a choice to decide when to work from home and office and didn't want to settle for a permanent place of work. (Singh & Kumar, 2020)

The entrepreneurial pursuits across various industries also took a hit during covid. Many small businesses and startups faced a significant reduction in revenue streams due to the impact on the global supply chain of both goods and services. Loss in productivity, global supply chain disruptions, reduced customer and investor demand, has adversely affected the entrepreneurial practices and morale of business owners and entrepreneurs across the globe. (Meahjohn & Persad 2020)

Indian economy and businesses faced some adverse impacts of the pandemic. The state of the Indian economy suffered critically

with the contraction of 24.4% in GDP from April to June 2020. Pandemic led to a 4% permanent loss to real Indian GDP. The most disrupted sectors were tourism, aviation, automobile, telecom, and retail sectors. Automobile Industry faced disturbances in the supply of raw materials as 25% of India's automotive parts are supplied by China. Suspension of manufacturing abilities largely affected functioning telecom industries. In the retail sector, food categories like tea, meat, spices that are exported to the US, Europe and China were heavily impacted due to a decrease in demand and domestic supply chain issues. (Das & Patnaik, 2020)

Conclusion

The IT industry of India has seen an eclectic nature of events and policies through the course of 50 years. Various policy measures were introduced aiming at the betterment of overall development emphasising on different sectors in accordance with sate of the economy at various stages of planning. The growth of non-traditional services sector transformed India, an agrarian economy into an exporter of modern services over the years. The boom of IT industry in India, that can be seen today was not instantaneous. Rather, it was a result of subsequent policies, laws, and reforms which gave birth to IT hubs like Hyderabad and Bangalore. Such pattern of growth for a nation whose independence is not even a century old shows remarkable potential.

From the Mahalanobis's foresight to inculcate computers in planning reforms of India during 1950's, the formation of Department of Electronics (DoE) in the 1970's, the New Electronics Policy (NEP) and New Computer Policy (NCP) in the 1980's, the liberalization reforms of the 1990's, to the startup spike in the 2000'. An amalgamation of all these events led to the IT revolution in India and established Telangana as a solid player in worldwide IT market. There is no doubt that IT industry and technology services are going to be shape the global future. To capture the essence of this upcoming growth, automation and artificial intelligence could be good focal point for further research.

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SECTION - 1

DOCUMENTING THE GROWTH TRAJECTORY OF THE IT INDUSTRY OF HYDERABAD

This section of the report and study dealing with the historical trajectory of Hyderabad primarily contains ethnographic data. Over twenty in-depth ethnographic interviews were conducted. After situating the interviewees/speakers in the scope of the study, the interviews were left unstructured and open-ended. Data from each interview was analysed. Cross-referred and authenticated by multiple interviewees, repeated common points were taken into the report's narrative. All interviews were recorded with the verbal permission of the speakers.

1. A Historians Perspective

This section details the historical usage of technology in Telangana & Hyderabad.

Tracing the historical trajectory of Hyderabad in the context of becoming a global IT-HUB, one can see that the city, at least since the late 19th century, has been at the forefront of technology.

In contemporary times, Hyderabad has been at the forefront, starting with the railway system and spearheading it to being the first developers and integrators of web 2.0. (Web 2.0 is the symmetric flow of data on the internet, a second popular iteration after the asymmetric one side push of data from the content host / producer to the user in Web 1.0)

1.1 The Deccan positions

Hyderabad was and is an essential and strategic part of peninsular India. We come to see that history onwards, to travel between long stretches anywhere in India, north, south, east, or west, one had to pass through the Deccan. Therefore, it was believed that "who ruled the Deccan controlled the rest of the country".

Neighbours on the western coasts had different dynasties through whom various rulers like the Dutch/Portuguese and others came to the Deccan. Trade routes went through the west coast from the Middle East, the exchange was done here in the Deccan and sent on to the east, to the Philippines, to Japan and China.

The historical trajectory of Hyderabad in the context of becoming a global IT-HUB, the city, at least since the late 19th century, has been at the forefront of technology.

1.2 The Deccan and Language

To this day, the erstwhile Hyderabad state, in the centre of this crucial geographic entity of The Deccan Plateau, is presently in 2021 called the state of Telangana. The etymology of Telangana comes from the times of the Trilinga Desha, three temples bordering the then Telugu speaking regions.

Erstwhile, Hyderabad and Telangana have a rich and eclectic set of languages in use. Official languages of Hyderabad state were English, Urdu, Telugu, Marathi and Kannada.

The Telugu used today has traces of Persian and even the Urdu spoken today has impressions of Persian and Marathi. The assimilation of new languages into indigenous languages helped create inclusion and foster fraternity in the society. 'Deccani' was thus a soulful infusion of all the five languages of the erstwhile Hyderabad state.

Archaeology, architecture, and history has been the legacy bequeath by great civilisations. The admixture of the Hindu-Buddhist art forms at Ajanta and Ellora and the Indo-Saracenic architecture since the Bahmani empire, and Deccani are all indicative of a rich civilisation in the region of Telangana.

1.3 Invasions and infusions

Non-native rule started with the invasions from the north. The Mughals took over the Golconda, and their vassals established Hyderabad. Subsequent Qutub Shahi rulers came from Iran but became part of the region as they learnt the language and made the local language a state language, unlike invaders that imposed. Qutub Shahi rule brought in a culture of trade and allowed an infusion of culture; hence was instrumental in making Hyderabad culturally diverse and distinct.

The Deccan has had the advantage of being ruled by several dynasties over the centuries, They have adopted from The Satavahanas, The Rashtrakutas, partly The Cholas and The Kakatiyas, and also a part of the Vijayanagar empire . Different communities continue to live together for centuries have imbibed the culture and traditions of various empires.

Each dynasty left a unique footprint in terms of architecture, language, coins and military history. The most visible influence is of the Kakatiya dynasty-architectural influences brought by them that is seen in present-day Warangal and all-over present-day Telangana.

Khilji, Tughlaq and Bahmani Muslim rulers dominated the area from 1324 AD onwards. The breakup of the Bahmani empire led to the establishment of the Sultanate of Golkonda (centred on the fortress town near the yet-to-be-established city of Hyderabad) under the Qutub Shahi dynasty. The Qutub Shahi rulers came from Persia/Iran and ruled with the help of Hindu feuds, revenue officials and bureaucrats. The Mughals under Aurangzeb took over the Golconda in 1687, and subsequently, the Nizams ruled as semi-independent rulers from 1717, Nizam-ul-Mulk declared independence in 1724 and his dynasty ruled until 1948 as the Asaf Jahi's.

1.4 Irrigation- Qutub Shahi's not only great builders of monuments but also lakes

Hyderabad is in the Deccan, land-locked and not having perennial rivers systems. In medieval times, Hyderabad's was known for its water harvesting technology; Hyderabad devised a local village level democratised system of water harvesting and lake fed irrigation. Being located high up on the hilly Deccan Plateau and having mostly seasonal rivers, the technology of local lake water storage and irrigation was an ingenious way of exploiting the city's geography the lakes were interconnected to make the best use of water to balance the waterbodies capacities and the uncertainties of the weather.

In medieval times, Hyderabad's was known for its water harvesting technology.

Located predominantly between the Krishna and Godavari rivers, seasonal rivers like the Musi river flowed through Hyderabad and then fall in the Krishna River facilitating trade and commerce. It is these rivers and river basins that have given Hyderabad its history.

Post the deluge of 1908, Sir Visveswaraya, the engineer, was called on to build the two dams that provide water to the residents of Hyderabad even today. In spite of modern-day interventions and encroachments in the lake beds, the water in these dams flows by gravity and does not use electricity even to this day. These are some of the engineering marvels in Hyderabad city.

1.5 Trade and commerce in the Deccan region – The Qutub Shahi Period.

Before the contemporary era, the Qutub Shahi period saw the region's trade and commerce peak. It was a highly multicultural society. People of different communities dressed differently spoke other languages. The Qutub Shahis were Shia Muslims, but they became part of the region (Hyderabad / Deccan). One of the rulers mentions explicitly that 'Telangandhra' was the jewel in their crown.

The Qutub Shahis realised the importance of trade and commerce, transport and travel. They were the centre of trade in the subcontinent. Connected by foot, they fell between the ports of Machilipatnam on the east coast of India and Surat on the west coast of India. To Machilipatnam, they were connected by boat in the monsoon season, via the perennial Krishna River and its upstream non-perennial tributary, the Musi which flows through Hyderabad.

Before the contemporary era, the Qutub Shahi period saw the region's trade and commerce peak

Qutub Shahis perfected exports and imports within the subcontinent. Products like pepper from the southern regions of Kerala were procured and sold to Northern India. This was done in competition with the Dutch and the French, who later started exporting from India to their own colonies.

Golconda diamonds were probably the only diamonds worldwide until the discovery of mines in South Africa in the later 19th century. All trade and commerce in commercially mined Diamonds happened from the Kollur Mines, which started mining under the Qutub Shahis.

Hyderabad also has a rich textile heritage. Gadwal and Ikat sarees of these regions supported the weaving community. Telangana being rich in cotton-producing lands, had ample raw material for cloth production.

Kalamkari of Machilipatnam, which initially consisted of Hindu religious icons, after fusing the Iranian aesthetic, found that it had a more outstanding market in Iran and the diversified and transformed design, led to miniature style paintings on cloth being exported to the Middle-East.

The Qutub Shahi rulers patronised the Kuchipudi Village and the Kuchipudi dance. Today, it is still this village that is the home to the dance's heritage.

With no sea near Hyderabad to produce pearls, the city's sobriquet is 'The Pearl City'. Pearl markets in Hyderabad came from the cultural-commercial bridge between local and Middle-Eastern trade. In Islam, shiny objects or gold is generally forbidden, but coloured stones were allowed. So shiny pearls would not be used by the Islamic people of the Middle-East. The sea of Basra in present-day Iraq produced the finest of pearls globally, but because their local custom/religion/Islam forbade their use, they were exported to Hyderabad, and the local gemstones of Hyderabad were imported to the Middle-East in

return. This trade happened from the western ports of India. Hyderabad was the only place that could hand-drill tiny pearls, leading to the pearl jewellery business boom.

Hyderabadi cuisine is as variedly influenced as its culture. It is a beautiful confluence of the Mughlai, the North Kannada , Telugu, and Marathi cuisines. It is a culinary experience of its own; it is also a fusion of cuisines of dynasties that have ruled Hyderabad.

1.6 Modernising Hyderabad in the 19th Century

Modernising of the state of Hyderabad started under Mahbub-Ali-Khan, the VI Nizam of the Asif Jah Dynasty.

Salarjung-The-First was a worldly-wise man who had a good working relationship with the British. This relationship would help modernise the state.

The Railway came to Hyderabad under his rule in the 1860's. The Nizam Guaranteed State Railway (NGSR) connected Hyderabad to Bombay's docks, and to Madras a little later. This increased the Hyderabad state's international trade. Hyderabad was rich in cotton. British cotton mills' thirst for raw material was fulfilled by making land transport of cotton easier to the Bombay port from hinterlands of the Deccan. The vast amounts of cotton produced in the dominions of the Nizam fed the Cotton mills of Manchester.

The Nizam Guaranteed State Railway (NGSR) connected Hyderabad to Bombay's docks, and to Madras a little later. This increased the Hyderabad state's international trade

The telephone also came to Hyderabad in 1884. The first connections were between the Secunderabad Cantonment and The British Residency in Koti.

Electricity came to be in the City of Hyderabad in the year 1906. This was one of the earliest cities in India to get electricity. The city's power was produced in a power station stationed on the banks of the Hussain Sagar Lake.

1.7 Development in the 20th century: Osman Ali Khan (Nizam) from 1914

A judiciary independent of the ruler was a previously unheard in those times, was adopted by the State of Hyderabad in 1919 with a bench of six judges (Telangana, n.d.). Modernisiation of Hyderabad State started in the 1920's with the rule of the last Nizam.

The seventh Nizam appointed the first director of archaeology from United Provinces in the 1920s. The first thing taken up was the unexplored caves of Ajanta and Ellora. There were no roads, no tracks that travelled all the way. Presently these sites are UNESCO World Heritage Sites.

The Hyderabad Public School was set up in the early 1920s. It has been a leading school since its inception. Today it is rated as one of The World's top 100 Leading Schools. The Osmania University was set up in the late 1910s after a four-year world tour by an entourage of experts studying the world's best universities.

During the reign of the last Nizam, Hyderabad leapt into another dimension. Educational reforms started happening in Hyderabad around the same time. The Hyderabad Public School was set up in the early 1920s. It has been a leading school since its inception. Today it is rated as one of The World's top 100 Leading Schools. The Osmania University was set up in the late 1910s after a four-year world tour by an entourage of experts studying the world's best universities. This university too has consistently been rated one of the best universities in the India.

1.8 Transportation

The British would go on to build Nizam's Guaranteed State Railway (NGSR). The Nizam paid about 5% of the annual revenue to the British. Nizam the VI provided the land for the railway. Irrespective of the projects financial success, Nizam's contribution to the British was set at a payment of 5 % of the annual revenues. The then Prime Minister Salarjung recognised this to be good deal for the state and saw through its implementation.

The Godavari valley railway was later added which aided the direct export-import link to Bombay's docks. Northern (present-day) Telangana is rich in cotton and tobacco production. Landlocked Hyderabad didn't have sea ports for exports before these railway lines.

Geographicaly, the central location of Hyderabad gave it access to the whole subcontinent. Almost all major rail and road connectivity passed through Hyderabad.

English, for the first time, was used on public signage and transport operations. This was to facilitate the employed persons who read English, like the Parsis and Anglo-Indians, to study and understand the functioning of locomotives and manage a railway set-up.

In 1932, the Nizam Railways road division was established, and Hyderabad had public buses for better connectivity.

Hyderabad was one of the first hubs for Aviation in peninsular India. The first flight landed in Hyderabad in 1911. In the suburb of Habshiguda, a flying club called The Deccan Aero Club came up. Regular flights in Hyderabad started by carrying mail to Madras.

Aviation was not sustainable financially; it needed state support. When Nizam-VII was approached, he gave directions to identify a

suitable place to land flights. A Belgian flyer was invited for a flight demonstration in The Secunderabad Cantonment. After the survey, the present-day Begumpet Airport was finalised.

The Hyderabad State Airline was called the Deccan Airways Limited

1.8.1 Consolidated transport

The concept of coordinated, consolidated transport planning in the Hyderabad State was maybe one of the first in the world to happen. The Nizam Guaranteed State Railways (NGSR) consolidated and managed the public transport of Hyderabad. Though the NGSR started with managing the railways, it later also managed the aviation in Hyderabad; from 1932, it started managing public buses introduced in the city and state. This division that controlled the public buses was called the 'Nizam State Railways - Road Transport Division'. Thus, Hyderabad was well-connected by air, rail and road.

1.9 Conclusion

In the four centuries preceding India, the erstwhile state of Golconda / Hyderabad was, for its day, one of the kingdoms at the forefront of technology in the subcontinent. They harvested natural material symbiotically and harmoniously to meet their needs. They used technology to advance their trade and commerce. The Kingdom of Golconda and The Hyderabad State were some of the wealthiest political entities of their times. Meticulous planning of their cities, citadels, necropolises, urban infrastructure, communication, irrigation, transport and infrastructure with the leading technology of their days kept them ahead.

Today, this spirit of advancement still lies in the heart of the Hyderabadi, in keeping them surfing on the crest of the wave.

2. A Geographers Perspective: 'United Streets of Ameerpet'

2.1 An Urban Researchers Perspective

To understand the IT industry of Hyderabad, it is important to factor in the geospatial changes the city went through. Maringanti has made several observations categorising them into real estate, the geography of labour, sources of investment, mobility / transportation, indigenous land structure, and job markets. As narrated to us by Dr. Anant Maringanti, within each section, he uncovers these aspects.

To understand the IT industry of Hyderabad, it is important to factor in the geospatial changes the city went through.

2.2 How do we think of places?

Dr. Anant Maringanti, tickles our brain with an interesting question, one which he has written in his book as well, about how do we think of places, of cities of spaces? Quite often than not, a place is identified with a particular characteristic, and that sticks. Maringanti illustrates with the example of Mumbai, known as the financial capital- the city of finance. This has become the city's predominant identity, missing its various other angles that capture the city. Through this lens, he delves into Hyderabad. Localities such as Lingampally, Ameerpet, and Teegalkunta in the 80's/90's he describes as impoverished townships, almost abandoned with a combination of sadness and sorrow. But it is intriguing how such places have gone on to foster a high level of surplus creation and turned around their previous grim identity.

2.3 The McKinsey Move

From the mid 90's Maringanti tracks back the seed of the IT industry of Hyderabad to one document, the Vision 2020. He says that tracing the origin of this document leads us to McKinsey, an MNC management consulting firm. It is interesting how this American firm manages to reach Hyderabad through a unique route. First, landing up in Kuala Lumpur, McKinsey persuaded Mohamed Mahathir (Former PM of Malaysia) to build a cyber tower. It then moved on to Calcutta to persuade Jyoti Basu (Former CM of West Bengal) to bring about changes in its state's economy and then approached Former CM, Andhra Pradesh to pursue the Vision of 2020. McKinsey convinced the then CM that there is a need for a Vision 2020 and to reimagine how the economy should work. They convinced him of how Hyderabad would be a focal point of this growth with this Vision-2020 move.

"Andhra Pradesh will leverage IT to attain a position of leadership and excellence in the Information Age to transform itself into a Knowledge Society" (Sudan, Towards 'Smart' Government: The Andhra Pradesh Experience, 2000).

2.4 The contextual history of Hyderabad that brings it to being the IT-HUB it is today

2.4.1 Leapfrogging the way to global growth

During the nascent stage of the IT industry, some idiomatic expressions made the rounds. The western countries had the industrial revolution, which made them industrially / economically overtake other parts of the world. Now with the information superhighways (IT) industry will help the east catch

up with the west. This was a popular narrative widely believed. It was a race in its essence, a global race for being on top of the growth game.

2.5 Hyderabad's Geography in contrast with the other port cities of India, and it had to look inward for growth

2.5.1 Juxtaposing Hyderabad to Port Cities of India

Indian cities of Mumbai, Calcutta and Madras (now Chennai) have been the most successful and witness growth both pre-independence and post-independence. These cities became necessary on the world map as they are entrepots through which raw materials were exported to the world. This saw the local capital investment in manufacturing on the hinterlands of these port cities. The industrial setup of these cities began due to their natural advantage of having ports, and that is how Calcutta got its jute mills, Bombay got its textile mills, and Madras got its machine mills (machine-based manufacturing/engineering works). At this point, you must be wondering where Hyderabad in the story is; well, it is not. Hyderabad was not at the receiving end of this industrial growth, unlike Mumbai, Madras and Calcutta. But why?

2.5.2 Looking inward for growth - The case of Hyderabad

With no ports, Hyderabad is landlocked. The growth for Hyderabad as an industrial space had to be garnered and built from within the city. Other parts of the country were decades ahead in setting up their industries, not just port cities, but others like Kanpur with its multiple textile mills by the 1900s. Hyderabad set up its first karkhana (factory) in 1916 in Hussaini Alam. Nizam, at the time, Mir Osman Ali Khan, decided to set up a button-making factory. The logic being the fact that the city was populated with Sherwani wearing elites. So began the Deccan Button Factory, which are collectors' items to this day, says Maringanti. Hyderabad not being a port city hindered its growth pace; it did have other resources, nonetheless. Hyderabad had the raw material in the form of coal. Therefore, a railway line was laid to send out coal from the Godavari valley. Hyderabad had dryland agriculture/cotton and a flourishing bazaar economy.

The Industrial Trust fund, equivalent to today's Telangana Industries Department, began setting up small and medium-sized factories in the town.

In the following 20-30 years (post-1916), there was a push from Nizams to industrialise the city of Hyderabad. The Industrial Trust fund, equivalent to today's Telangana Industries Department, began setting up small and medium-sized factories in the town. Hyderabad then saw the emergence of industries such

as the Charminar Cigarettes factory, the Golconda cigarettes factory, Deccan Glass factory, Allaudin company making sheet metals that slowly started making metal bodies of public buses etc. The effort to spring up the industrial movement in Hyderabad was seen and felt, but it was not as much as other cities.

2.6 Chronicling the change in Hyderabad since the 1960s

The arrival of the 60s in Hyderabad brought about some changes to its existing industry sector. Drawing parallels between Hyderabad and Bangalore, Maringanti says both were land locked and politically important; they started to push for Public Sector Undertakings (PSUs). At the same time that the industrial impetuous was being put in Hyderabad, a big push for the agriculture sector was ongoing in the 60s. The green revolution was being ushered in, and dams were being built.

Thee advent of this change in the industrial sector provided the necessary linkages for the story of the city's transportation, its housing and the jobs it would see in the years to come.

All around Hyderabad, factories like BHEL (Bharat Heavy Electricals Ltd.), HMT (Hindustan Machine Tools), HAL (Hindustan Aeronautical Ltd.), ECIL (Electronics Corporation of India) started propping up. The defence sector set up DRDL (Defence Research and Development Laboratory) and DRDO (Defence Research and Development Organisation). The Pharmaceuticals sector saw IDPL (Indian Drugs and Pharmaceuticals) being set up. These PSUs came up by taking up vast amounts of land, and this is where the employment generation happened in the city. Maringanti says the advent of this change in the industrial sector provided the necessary linkages for the story of the city's transportation, its housing and the jobs it would see in the years to come.

2.7 Patterns of work and mobility in Hyderabad

During the 1960s and 70s, you have essentially three kinds of movement largely visible in the city. One set of people travelled to the centre of the city for work, where the secretariat was situated. The second set of people went to the Charminar area for an informal type of work. The third travelled to the northwest side (Lingampally, Patencheru, Chanda Nagar, Sanath Nagar, etc.) or slightly towards the northeast of Hyderabad towards ECIL for factory-based work. Factory workers used to travel in factory buses in shifts, and Hyderabad had a system similar to that of the Dabbawallas (of Mumbai). Lunches would be picked up on bicycles and delivered at the factory to the workers. This was the pattern of jobs, transportation, and mobility in the 60s and 70s in Hyderabad.

The 1970s began to see a shift in the work and mobility patterns in the city. The beneficiaries of the agricultural surplus created from the regions of coastal Andhra were looking for avenues of investment. They were looking for urban centres to invest in; Vizag and the other Hyderabad had a couple of options. Hyderabad, Maringanti narrates, was going through an unstable environment where the city was fraught with its political situation. The agitation for a separate state of Telangana was bubbling up in the late 1960s, mainly with employment and education issues. The uncertainty and turmoil persisted through the 70s; only in the 1980s, Hyderabad saw some assertive political changes.

The 1970s began to see a shift in the work and mobility patterns in the city.

In the dire political environment of the state of AP emerged a leader endogenous to the state. Mr. N.T. Ramarao (NTR) entered the political picture with a message and intent to unite was. A matinee idol drew attention to himself and attracted the voter base, but above all, he presented a marginalised dream. Maringanti explicates that the vision and promise by NTR was simple in the sense that the poor would get subsidised food, persons with flair for polity would be given a mandal in the state. If the marginal farmer or small farmer requires water for irrigation, there would be free power or substantial subsidy. To set up a borewell and make profits equal to the commercial successes that the coastal regions experienced due to the green revolution. These dreams and vision that the people of Hyderabad and the united AP latched on to and brought the matinee star into political power.

In the 90s Liberalisation-Privatisation-Globalisation (LPG) economic reforms had kicked into motion. The market for durable consumer products had opened up. White goods such as refrigerators, motor vehicles, telephones, televisions started to develop a market. Hyderabad began producing all of them. ECIL made television sets, Allwyn produced refrigerators, watches and scooters (Pushpak). Along with this new range of consumer durable goods market and manufacturing in the city, the commercial markets were also budding during the 90s. Ploy-clinics, tutorial-colleges were the kind of business ventures propping up in some regions of the city.

With the LPG reforms he market for durable consumer products had opened up. White goods such as refrigerators, motor vehicles, telephones, televisions started to develop a market

2.8 Spatial specialities

Over the next decade, post the 90s, the city saw growth of certain spatial spots in the city, which added the most value to the IT

boom. Particular areas begin to grow prolifically in the next ten years; one of them was Ameerpet. Ameerpet and the areas beyond it towards Sanath Nagar (industrial regions developed in the 40s) were outside the city limits. At that time, the map of Hyderabad was not representative of these areas; they were considered to be the outskirts of the city. This area had lots of lands taken up by the AP housing board and then made it into a housing colony. Sites such as Sanjeev Reddy Nagar, Vengalrao Nagar were growing to be the new centres of hope. This land had a specific type of crowd as takers. These persons were most often found to be those who did not own any property yet in Hyderabad and worked in higher education institutes and few businesspersons. Here, Maringanti points to home ownership, especially in the 80s and in these areas specifically. Home ownership in the 80s usually would happen in the mid-40s (age), by which time the children were ready to be college-goers. In the next few years, many of these families were getting ready to send their children overseas to study.

2.9 Hyderabad's Transnational Connections (Circa 1977-78)

Interesting connections began to take place in Hyderabad. Two distinct transnational connections emerged, the first was between Hyderabad and the Middle-East. The new labour markets in the middle-east were opening up in large numbers. The demand and pull were such that persons with existing jobs would go on for 1–2-year leaves without pay and move to the Middle-East to work for a few years and move back. The second connection was with the United States of America. Young people moved to the US. Post their education for Bachelors, Masters or a PhD, particularly in medicine and engineering. Here, Maringanti draws our attention back to the spatial pattern mentioned earlier. Those emigrating, especially to the US, had connections to Vengalrao Nagar and Ameerpet. Most emigrating persons belonged to these areas; social networks operation can be observed with this pattern, he says. These networks played a significant role in the 90s to bring work back to the city in an offshore model.

Interesting connections began to take place in Hyderabad. Two distinct transnational connections emerged, the first was between Hyderabad and the Middle-East and with the United States of America.

During the early 90s, the Software Technology Park of India (STPIs) was set up, with which, offshore work began coming into the city. The Southern regional headquarters for STPI started up in Maitrivanam, Ameerpet. This made Maitrivanam an anchor point for IT and IT enabled services where these services were being exported from Hyderabad to other parts of the world. Soon, from offshore services, STPI-Maitrivanam-Ameerpet also

became a centre from where IT personnel were also being sent to work abroad from body-shopping centres. Biao's book – "Global Body Shopping: An Indian Labor System in the Information Technology Industry", precisely talks about these issues (Biao, 2007). In particular, his observation points to a large number of graduate children of affluent/dominant-caste land, owning people of coastal Andhra having a foot in Ameerpet in a hope to move to the US as 'bodies' in the body-shopping trade, aided by H1B Visas. This movement and demand shift pattern can be seen and was possible due to a massive marketing job termed the Y2K problem. Date formats in all software created in the world until the 1990s needed to be migrated to take in the four-digit year (XXXX) instead of the earlier two-digit format (XX) or else the digital world shall collapse. Not taking away from the genuine need for this call and the majority was an exaggeration, he says. This marketing pitch took off, and people were being hired worldwide to deal with this 'crisis'. Hyderabad, in this scenario, had the most significant number of 'bodied' workers who were sent across the globe for these IT services. Ameerpet became a funnel that sent out people to the US in such massive numbers that it earned its nickname, the 'United Streets of Ameerpet'.

Ameerpet became a funnel that sent out people to the US in such massive numbers that it earned its nickname, the 'United Streets of Ameerpet'.

Ameerpet became the hub for IT training centres. Maringanti describes Ameerpet as that destination where all types of IT related information and courses could be found. The rarest of computer languages would be taught in centres spread across streets. He says, "Ameerpet is a fantastic model for decentralised, informally organised, self-created university establishment".

The advent of the 21st century saw a strange pattern emerging; Maringanti narrates a few of his observations to corroborate them. He talks about how he noticed an old couple sitting and chatting on the Tank Bund. To Maringanti's surprise, the old lady complained to her husband of her son-in-law about how it would be nicer if he had picked up JAVA and C++! He says there was a minimal possibility that the old lady knew what these computer languages were or what they meant technically, but she surely knew that this is where the jobs were.

This story was the reality of the early 2000s; these computer languages and courses had become household terms. In general, people started to realise that this is where the jobs were and what would earn a decent living. During the time, a transnational system facilitated the circulation of money, ideas, bodies, and cultural values between New Jersey and Hyderabad and Dallas

and Hyderabad. Also, this period witnessed massive exchange of international services and professionals between the Middle East and Hyderabad. Both these transnational connections saw their ups and downs due to the fluctuations of the global financial system. Transnational households were growing with these new connections (Khandekar, 2016). This transnational movement and corporate networks brought about a creation of new infrastructure and vision in Hyderabad, culminating in building the HITEC city on the west side of Hyderabad.

From the essence of all the above glimpses come a combination of factors leading to creation of new infrastructure. An example would be increase of colleges and technology graduates and their need for infrastructure in high-capacity fibre optics to connect Miyapur to river-side California. To sum up, we had a political leadership in the state that persuaded people to embrace the sector; we had households trying to make their calculations. We had real estate markets available for investment, caste networks playing their role in people and resource mobility.

HITEC city is a story of broken hearts, of dreams coming together and also of broken households. This, in a nutshell, is the story of HITEC city and IT industry of Hyderabad at a social level (Saavala, 2010).

2.10 Landmarks of Hyderabad in terms of Technology and Employment

In the 80s the electronics manufacturing industry led to the manufacturing of computer hardware and systems

In the 1980s, ECIL manufactured electronics, electrical and electromechanical goods. The electronics manufacturing industry led to the manufacturing of computer hardware and systems. The computer software industry saw its boom with the emergence of Ameerpet and the transnational connections with the Middle East and the United States of America. The growth of software companies from then on got a boost with the establishment of the STPI. During 1996-97 the dream for the Western side of the city to become a vital IT-HUB came to life with the creation of Cyberabad.

2.11 Geography of Cyberabad and the Indigenous land-holding-structure of Hyderabad

There was a specific structure of land ownership in the old Hyderabad state. Under the Nizams rule, there were three types of land, i.e.,

1. **Diwani Land** referred to revenue land where one could free-hold title or the government-owned the revenue land

2. **Jagir Land** was where the Jagirdar, a tax collector, did not own the piece of land but collected tax on behalf of the ruler, where he plays a part of it to the ruler and keeps the rest.

3. **Sarf-e-Khas Land** were lands meant for the Nizam and the family of the Nizam.

Each of them was controlled by a different department and had its own respective mapping system. Any changes in the land-holding structure or ownership were needed to be updated in all three departments and their respective maps. If not, it created a disharmonious mess. Post-independence ushered in many land-use changes and ownership. These changes were not being updated simultaneously in the three departments. The Government of India took over Sarf-e-Khas, jagir land and the revenue land. Due to the availability of massive lands with the government, investments started to come into the city's western side. Initially, the western side began to develop with only two pink coloured towers (The HITEC buildings).

The government had proactive propagators and advocates of the IT industry. Investment started to pour into Hyderabad.

For a very long time, nothing else came up in the present HITEC city area. The state government started promoting this part of town. They started advertising land availability, which meant possibilities for growth. This was to urge new ventures to come and set up shop in the city. The government became an essential partner for the development of the IT industry. The government had proactive propagators and advocates of the IT industry. Investment started to pour into Hyderabad, primarily for IT businesses catering to data-processing and data-warehousing, of which Hyderabad had become a specialised centre.

2.12 Present-day Hyderabad as an IT-HUB

Companies such as Uber, Facebook, Amazon have wanted to come to Hyderabad, but why? Maringanti says Hyderabad has young people. It has many IT graduates, a good quality of life and a proactive government backing the sector in setting up infrastructure. With these factors, Hyderabad integrated into the global economy. However, it is not known for 'high-quality patentable work', but it is known for cheap idle labour services that could be performed with low-quality labour. All of this became possible after 2002 due to the American IT industry crisis, leading to the compression of US labour markets. Hyderabad's place on the world map emerged amidst this crisis.

2.13 Are we lagging in the Domestic Market/Industry?

The domestic market for IT services is still not too big in India. Hyderabad and India, in general, do not have a critical mass in terms of quantity or quality of 'innovation' needed to serve the domestic markets. Most successful domestic medium to large businesses has their captive software development divisions catering to their needs. Most of the domestic software industry is geared towards serving international backend services or maintenance. The large IT companies that do exist here in India are back-office development centres. The size of the domestic software market is a long way away from the export market.

2.14 Conclusion

Hyderabad has been lucky to have the bounty of the land that it has, and it has a very utilitarian geography of the land too. Its pre-independence land usage pattern has dramatically aided the bounty that has been left for the expansion of the city from the 1960s onwards. Even today, there is a considerable amount of land that exists for Hyderabad to grow. Issues like the fidelity of post-independence land records have recently been reconciled, and systems are coming into place to bring coherence in record keeping. Migration into Hyderabad over the years has symbiotically aided the city's development. Prudent planning and sustained support to the plans are what ushered the rustic four-hundred-year-old city to the becoming of an IT-HUB.

What needs to be watched out for is the future expansion of the city. With all the aspirations of the place, its people, the super organic needs layout a higher pedestal for a sustainable model. Symbiotic sustainability between natural elements and humans needs to be a foremost priority.

3. An Academics Perspective: "God created Bangalore to make Hyderabad look good!"

Hyderabad has been growing as an IT-Hub over the last few decades. Mr. Ramesh Loganathan, an insider of the industry and an academic at IIIT Hyderabad, shares his journey and narrative of the IT industry.

3.1 Hyderabad's IT journey over the years

3.1.1 Technology product cluster to Software services hub

In the early 2000s, Hyderabad was growing as an IT space in the country. Loganathan says that not many people were and are still not aware that in the 2000s, Hyderabad had more start-ups than Bangalore. He recalls his interaction with one such start-up,

which made him change direction from a relatively secure plan in hand. He was working in the US at the time on Java (a programming language), although only a few years old, the programming language had created worldwide interest. During this period, Java was used to build applications. Several new applications were coming up, especially web-server applications (Internet 2.0). Web server applications had become popular at the time. These were observations that Loganathan made from the global sector hub in the US, and to his surprise, the budding IT sector in Hyderabad too was heading in the same direction. Hyderabad had one of the first and only companies, Pramati Technologies, implementing these web-based applications. Pramati Technologies Pvt. Ltd. was one of the only two companies in the world which were working in the web-server application space. Leaving his secure job in Bangalore and a neatly planned out life, he says he jumped at the opportunity to get involved and work with this company in Hyderabad.

The early 2000s is usually credited to Bangalore's sprout of the start-up culture, but Hyderabad was not too far behind.

The early 2000s is usually credited to Bangalore's sprout of the start-up culture, but Hyderabad was not too far behind. In Loganathan's opinion, the initial momentum for the start-up industry slowly fizzled away in Hyderabad's IT industry. He went on to point out that Hyderabad's industry cluster growth was as early as '98. Cyber-towers in The HITEC city of Hyderabad was one of the first and largest IT buildings in the country. Almost 60-70 per cent of the building housed technology product companies. Companies such as Microsoft and Oracle are a few to name. Other cities in the country did not see such clustering of companies, especially technology product companies. Even cities like Bangalore, Chennai, and Mumbai which were significant IT clusters by then, did not have this kind of clustering. Other IT industries of the country at the time were focusing on the services side of the industry. The research and development (R&D) centres were set up in Hyderabad due to the industry's initial clustering throughout the 60s, 70s and 80s.

The technology-product side of the sector is vital to embrace for sustained growth and maintain a cutting edge.

However, the city's IT industry lost momentum in the setting up of product companies and shifted towards the service side of the industry. Gradually, post 2003 and further years saw a shift of the IT sector towards service provision in Hyderabad and nationally.

According to Loganathan, the technology-product side of the sector is vital to embrace for sustained growth and maintain a cutting edge. The shift towards the services side of the sector grew tremendously in terms of size. Although the former side may not

become prominent in terms of size, he believes it is needed in the industry to have an edge.

Institutions ranging from engineering and technical education to government research labs, such clustering of top institutions is unique to Hyderabad.

3.1.2 The Education element

Hyderabad has a unique combination of academic and research institutions that cannot be found anywhere in the country. Institutions ranging from engineering and technical education to government research labs, such clustering of top institutions is unique to Hyderabad. Loganathan believes that this cluster and combination of institutions has been the critical factor for the growth of the IT sector of Hyderabad.

Q.S. university rankings of Hyderabad institutions (National level 2020)

University of Hyderabad (UoH)	All India Rank 8
Indian Institute of Technology Hyderabad	All India Rank 15
Osmania University (O.U.)	All India Rank 35

Scimago Institutions Ranking of Government research labs in Hyderabad (National level 2020)

Council of Scientific and Industrial Research (CSIR)	All India Rank 1
International Crops Research Institute for the Semi-Arid Tropics India (ICRISAT)	All India Rank 2
Centre for Cellular and Molecular Biology (CCMB)	All India Rank 9
Defence Research and Development Organisation (DRDO)	All India Rank 26

Although Hyderabad has one of the top institutions in the country and has large numbers of technical colleges, there is a trichotomy in quality.

Both the above rankings are presented to give a glimpse of the quality and quantity of institutions in Hyderabad on a national level. The Q.S. University Ranking includes few parameters like academic standing, web presence, graduate employability, research quality, the diversity of each institution's international collaborations, and internationalisation on campus (QS Quacquarelli Symonds Limited, 2020). The average performances in these sectors create the overall score for a university. The Scimago Institution Ranking (SIR), on the other hand, has been used to rank the government research institutions in Hyderabad (Scimago Institutions Rankings, 2020). SIR uses three criteria 1-Research, 2-Innovation and 3-Societal impact. Rankings are done according to a standardised methodology.

Loganathan, while talking about the contribution and importance of these institutions, also points out some shortcomings. Although Hyderabad has one of the top institutions in the country and has large numbers of technical colleges, there is a trichotomy in quality.

These technology institutions can be classified into three tiers. Top tier colleges have good quality education, where the cream of the talent come out of institutes-of-national-importance; some graduates even go on to better universities globally. Tier two of these institutions lack the quality of work and even in the depth of education provided. Other states outperform Hyderabad in this category or colleges. Furthermore, the third tier, he says, is a better lot but only can be said so compared to same other states.

This impacted the overall quality of growth. Hyderabad is still considered to be second to Bangalore in terms of the nature of the IT companies in the city. We will find that companies like Flipkart and a few others are located in Bangalore more than Hyderabad.

There is a perception that Bangalore is better by leaps and bounds and hence is a favourable destination, but in reality, it is only marginally better than Hyderabad. This perception worked for Bangalore and worked against Hyderabad. Investing in the second-tier colleges, Loganathan believes, would have helped with the image/perception to be created.

These technology institutions provide the volumes of graduates required for hiring at the basic knowledge level but are not producing quality graduates. There is a quality crisis in technical education in the country and Hyderabad as well.

These technology institutions provide the volumes of graduates required for hiring at the basic knowledge level but are not producing quality graduates.

3.1.3 Research

Hyderabad has the largest concentration of central government research labs in the country. They range from agriculture to defence, pharmaceuticals and more. The number and value of these institutions make Hyderabad unique. The missile program of the country is run out of Hyderabad (DRDO), he says. From concept to development, research to manufacturing, the country's missile program is based out of Hyderabad. Other research institutions like the Centre for Cellular and Molecular Biology (CCMB), The Indian Institute of Chemical Technology (IICT) and Osmania University (OU) and their research strongly supports the pharmaceutical industry. The intense life sciences programs in OU has been the grounding/foundational factor for the rise of the pharmaceutical industry in Hyderabad. On the

whole Hyderabad has a robust non-academic research lab cluster. The missile industry, Loganathan says, is as big as the IT industry in the city, not in terms of size but in terms of capital investment and expenditure. The missile manufacturing ecosystem produces high-end ancillary units and is one of the best in precision engineering and manufacturing.

3.2 Hyderabad's Infrastructure

In terms of infrastructure, Loganathan praises Hyderabad's quality of infrastructure. As early as the 2000s, Hyderabad has had wide roads, and all major roads had medians, which he says was not as common as it seems today. He recalls instances from Bangalore, where the roads had no median. It had only one road called "double road" it became symbolic as it was the only one with a median! Hyderabad, he says, has always had better infrastructure throughout. Shortcomings do exist to this date, but he says, "if anybody complains about infrastructure in Hyderabad, I will say, please go to Bangalore and then come back, you will appreciate everything that Hyderabad has to offer". Not just Bangalore, Hyderabad has been relatively much better than most cities in the country.

3.3 Local Collective and Supportive Administration

3.3.1 HYSEA

As early as the 2000s, Hyderabad has had wide roads, and all major roads had medians, which was not as common as it seems today.

Another supportive factor for the IT industry in Hyderabad has been the local collective. Hyderabad Software Enterprises Association (HYSEA) is a city-based IT companies collective that facilitates the industry to interact with the government and globally. Loganathan became part of HYSEA during 2006-07, and being both an insider and outsider lauds the efforts of this collective. HYSEA is the only regional body in the nation, whereas the rest of the states have the National Association of Software and Service Companies (NASSCOM).

3.3.2 Role of Government

The efforts of the local collective would be in vain without a proactive administration. The government has always taken a forward stance and been supportive of the IT industry in Hyderabad. The states have had one of the friendliest IT ministries. Every successive government, irrespective of its political party, has extended its support to the IT industry.

During the recession of 2008-14, Hyderabad was not perceived as a favourable destination for IT Much uncertainty persisted in the city at the time. Yet Hyderabad had a growth which was more or

even higher than most cities in the country during that recession. During this period, the city faced challenging times due to the Telangana agitation (for a declaration of a separate state). The overall perception of the state and city had been affected, says Loganathan. There were apprehensions by the companies outside of the state, concerns regarding the impact on the sector. However, there was no effect on the industry, he says, there were assurances by the government and administration that the industry's growth will not be affected, and so was the case. Although some opportunities went to Pune and Mumbai at the time, Hyderabad still grew more than most IT cities. Today only Bangalore is growing faster than Hyderabad, both in terms of percentage and quantity. The administration was pro IT industry even during the recession.

3.3.3 Telangana State Innovation Cell (TSIC) & Society for Cyber Security Council (SCSC)

Loganathan started and headed the TSIC as Chief Innovation Officer. The TSIC was set up in 2017 under the State Innovation Policy. Incubators and accelerator networks were set up with about 40 research incubators. In providing mentorship for start-ups, seminars and meetings were conducted. This has been an active group pushing the technology sector to foster an innovation-driven economy in the state.

The Society for Cyber Security Council (SCSC) is a joint society between industry and the commissioner's office in Hyderabad. Its objective is to provide for a safe and secure ecosystem. Many cities have been trying to replicate the SCSC model but are getting nowhere close to Hyderabad. The reason behind the success with the SCSC is the ease of implementation. The IT business clustered geographically in Hyderabad proved to be a plus point for such an initiative. Easy to facilitate as industry clustered in one place Madhapur and HITEC city. The implementation initially starts with one cluster and then expands across the city. Presently SCSC looks into the extended residential areas as well. Security is not only about companies it is about the employees and service providers too. An example Loganathan presented was the working employee hostel. Only in Hyderabad, all working employees' hostels are listed. Some inspections take place, and there is cooperation from the hostels as well. He goes on to say that to ensure safety; the SCSC has installed cameras. Information and guidelines are provided to employees/ hostel staff in cases of emergency and general safety.

3.4 The Bangalore vs Hyderabad Model

Loganathan believes that in the debate regarding the Hyderabad and Bangalore model for IT, there is a perception that Bangalore is and has been better. He says there is no specific reason to believe that this is true other than a herd mentality.

There is a perception that Bangalore is and has been better. But there is no specific reason to believe that this is true other than a herd mentality

3.4.1 Bangalore

Although the climate does take some credit, it has not been a deciding factor. The city has had strong electronics manufacturing presence since the early 70s and 80s with industries like HAL, BEL, etc. This became the base for foreign companies like Texas Instruments (TI) and IBM to be the first place to set up shop in India. Loganathan recalls T.I. had horror stories of the initial years in Bangalore where computers were being delivered on bullock carts in the middle of the city! Later in the 90s, the herd mentality took over other foreign companies that wanted to set up in India. Companies like TI and IBM were already there in Bangalore; therefore, the city was an obvious option. Very few companies broke out of that perception or did their legwork to evaluate other options, says Loganathan. Another added plus that Bangalore had a "coolness" factor in terms of climate and a budding western culture which seemed to attract the ex-pats.

3.4.2 Hyderabad

Hyderabad had to fight hard against the herd mentality. The companies needed convincing to set up in Hyderabad instead of Bangalore. The companies that did their background work would have seen that Hyderabad was viable and only marginally behind Bangalore, says Loganathan. Despite the initial momentum gained by Bangalore, infrastructure is terrible in Bangalore, he says. What Bangalore had in the 80s, now Hyderabad is starting to see that trend and inflow of companies. Loganathan has been a resident of both cities and worked in both and believes that,"God created Bangalore to make Hyderabad look good!". Hyderabad is equally good both in terms of climate and culture but not popularised/ known even today.

3.5 The Start-up scene

As mentioned earlier, the early 2000s saw Hyderabad as a budding start-up space. However, again, Bangalore was an overpowering force. The herd mentality mentioned earlier was already created; most star-ups moved to Bangalore post the angel investing round. One could notice this trend across the country. Budding start-ups used to gravitate towards Bangalore during

2007-08 to about 2014-15. Hyderabad had become the second-largest IT-Hub in 2014-15, bigger than Chennai as compared to the beginning of IT industry where other cities like Chennai, Bangalore, Mumbai, NCR were bigger than Hyderabad.

Hyderabad had become the second-largest IT-Hub in 2014-15.

Later stage support for start-ups was not as strong in Hyderabad as in other cities. Start-ups grow till the angel round of investing, but not beyond. Conducive environment is available for a start-up but has not been able to grow beyond a particular stage. A successful start-up environment is not available in Hyderabad. Angel Investors, mentorship by successful entrepreneurs, and high-quality start-up experiences is what Hyderabad lacks to create. The start-up environment has always been good, but in recent years due to state innovation cell and T-Hub (Technology Hub), there has been a positive amplification of efforts.

3.5.1 Start-ups and their future

Loganathan opines that life science products and technology products need global visibility and most start-ups from Hyderabad are in that space. He says that the culture and perception of Hyderabad as a start-up destination has been developing slowly for the past 4-5 years, which is a plus for IT industry growth.

3.5.2 What needs to be done to complete a start-up Lifecycle?

To create a sustainable ecosystem for start-ups to breed and survive, Loganathan suggests a few measures. One of them is to set up think tanks to offer research support, to build policy support and program support for the start-up industry in the city. Bangalore's IT industry grew not only because of policy support. The city attracted companies, NRIs, expats due to its initial image of being a start-up hub. There is no model that Hyderabad can replicate in this space; therefore, it is imperative to invest and indulge in creative thinking. Hyderabad has quality infrastructure, research units, talent pool, industry and an innovation-friendly government which makes it conducive for better growth.

For an enabling ecosystem for startups we must set up think tanks to offer research support, to build policy support and program support for the start-up industry in the city

3.6 Conclusion: Opinion on the future of the IT sector in Hyderabad

Hyderabad, as a city in different aspects, is a well-connected city. Loganathan is of the view that the city is well built and connected in terms of infrastructure, whether it is the wide roads and transport for connectivity or the IT cluster (HITEC city area). Hyderabad is a city with an estimated population of 1 crore, but

the accessibility of networks makes it seems like a small village, says Loganathan. The business networks are strong, closely knit, and unique to the city. Senior leaders in various industries are willing to help and contribute. With this rich background of networking, Hyderabad can push boundaries even further to do more, he says. A collaborative effort between the administration and various research entities will elevate Hyderabad's IT sector. Convergence of hardware in defence, manufacturing, software, and life sciences and strengthening the existing connections, the city will cross into new orbits and do much better in the technology space in the coming years. Therefore, convergence is key.

The other fundamental change Loganathan hopes to see is a change in the direction of work. He stresses the importance of reversing the industry's flow from India to the rest of the world. By this, he means that India needs to be the source for creating and disseminating technology products in the world. For most part of the industry's growth nationally and regionally, it has been service-based. The service side of the IT industry is predominantly low-value work that India does for the global market. India, he says, needs to have product development as its focus.

Furthermore, the shift, he says, requires external support and will not find the momentum organically. Indian IT industry has been predominantly providing services, primary idea formulation, strategic planning is performed elsewhere, and most backend work is done here. The organic process of stimulating indigenous technology products will be slow and unfamiliar to India's IT industry. To build the product side of the sector, it is crucial to understand the markets, the structure, the requirements of the end consumer. We (India) lack the skills for the industry to take its course; inorganic or external stimuli are necessary.

4. A Technocrat's Perspective

4.1 The IT industry journey post the 1970s

Mr. CVSN Murthy calls it an exciting journey of the IT sector in Hyderabad and its gradual growth into today's global hub. He calls it intriguing and equally essential to know the several contributions and efforts by individuals, governments, and institutions to develop the IT sector in the county and regionally.

4.2 IT career trajectory

Mr. Murthy has been part of the industry from its nascent stage in

the 1970s. He looks back to the beginning of his career, as a graduate engineer from Kakinada Engineering College, diving into an apprenticeship. Murthy trained in the design and development of circuits for the computer model TDC312. These were manufactured by Electronics Corporation of India Limited (ECIL). These systems were logical units consisting of electronic digital circuits as there were no microprocessors back in the day. Everything from the Arithmetic Logic Unit (ALU), control unit, and memory was built into separate modules inter-connected which were each huge. They were huge as they were third generation computer systems or hybrid (a combination of second and third-generation computer systems).

Having been trained in the design and development of circuits, he later went on to work with the Administrative Staff College of India (ASCI), Hyderabad. He joined as a systems engineer on the computer model EC1030 (imported from Russia), a mainframe computer equivalent to the IBM370 range. ECIL, at the time, placed its computer system, the TDC12, in the ASCI premises. This was a move by ECIL to promote its manufactured computers and set up a barter with ASCI. Soon after, ASCI set up its computer division to work on and develop software systems. He recalls his training in Moscow on the design and architecture for the EC1030. After his fruitful years of experience he left ASCI in 1980. He said many people started to leave ASCI due to policy decisions by ASCI's Board of Governors. Soon after, he started his own company 'ACS technologies limited' (ACS), one of the first IT companies in private sector in Hyderabad which is still active and when others vanished. ACS carried out work that ASCI's computer division earlier used to do. ACS Technologies worked to create local talent with the support of AP Technology services (IT services wing of the then Government of erstwhile AP). Murthy explains that he preferred local talent as it was readily available for training and development. He and his partners via ACS built a reputation of reliance and good quality with the Government of AP and the local Industry. He continues to work as Director at ACS and contributes to the sector in all ways possible.

4.3 ASCI its development, vision, and its journey into oblivion.

While talking about his experience at the Administrative Staff College of India(ASCI), a leading and highly reputed management institution in India, Murthy answers questions regarding the initial push/drive to venture into the computer

science arena. ASCI was established on similar lines to the British Administrative Staff college of post-independent India. It was set up to train the working staff, senior executives from the government and Industry, in various fields outside of their areas of expertise. ASCI also catered to training foreign nationals and officials.

4.3.1 ASCI's computer division

Murthy lauds the vision and drive of one individual. Mr. N.P. Sen, the then Principal of ASCI, envisaged the need and importance of software development and exports. He anticipated the demand from Europe at the time, not the US, for software exports.

Computers were emerging into the management consultancy field. He recalls that the Vizag Steel Plant outsourced the processes and management Information (MIS) systems to ASCI's management consultancy division. ASCI carried out administrative and management responsibilities. ASCI's main reason to venture into the computer division was to facilitate the growing penetration of computers into the management division. It was then that N.P. Sen proposed setting up a training centre at ASCI for computer training, awareness, data processing and software development.

ASCI was set up to train the working staff, senior executives from the government and Industry, in various fields outside of their areas of expertise

When the Police department started to use the computer system, a TDC312 in Masab Tank, Hyderabad, a DGP, attended one of the training sessions at ASCI. Murthy recalls the conversation with him. Murthy was asked a question, "What is the difference between hardware and software?" pointing out the curiosity and need for computer training. The police department had started computer integration to help the department's function, and subsequently, the officers were trained at ASCI.

The training at ASCI was essential, as the educational sector was not as equipped to provide the required skills and knowledge in IT. There were only a handful of educational institutions in technical and science education in AP at that time. Osmania University (OU), Regional Engineering College (now NIT Warangal), Andhra University, Kakinada engineering college, Anantapur engineering college, Nagarjuna Sagar engineering college (present-day JNTUH). These were the only available options to pursue an engineering degree in the Telugu states. All expertise in IT came from this handful of institutions. The Electronics and Communication Engineering (ECE) branch of engineering was first introduced in 1960s only in OU Engineering College and present JNTU college of engineering, Kakinada.

Computer Science Engineering (CSE) was not available as a separate branch till late 70s except in the IIT's Mtech, Computer science, was introduced in IITs in 70s at postgraduate level. Software training for government departments and officers began at ASCI. They employed a well-trained workforce to work on developing the systems for their clients.

ASCI's long-term vision and initiation made it the first institution to have a mainframe available in Hyderabad. The computer mainframe at ASCI was used by HAL, BHEL, and The Defence labs. There was a queuing-up mechanism for the officials of these organisations to use the system. These systems were tedious to use and required much manpower. He recalls being summoned at various points in the day and night to boot the system to start running again. The power connectivity was precarious in those days, which meant a disruption in the flow of work as there was no UPS system available in those days. The systems were sensitive to power outages and fluctuations, and whole systems, programs, commands had to be fully reloaded after a power cut to resume work.

4.3.2 ASCI's Demise

ASCI slowly receded its computer division entering into the 1980s. Murthy recounts that in the 80s, the principal at ASCI, Mr. Dsouza was against computerisation. Subsequently, ASCI shut down its computer science division, and within three months, the staff was moved to Computer Maintainance Corporation Limited (CMC) ,which was set by the Govt. of India and other leading organisations. Following the closure of ASCI's computer division, CMC took away many of the projects earlier performed by ASCI.

4.4 The gradual growth of IT in Hyderabad

4.4.1 The 70s

With excitement about recalling his early days in the sector, Murthy compares it with the present-day growth of the sector. In those days when the hardware was large in size, it used to occupy large space including huge space for storage of magnetic tapes, punched card decks etc. Today all of it fits in a quarter of what our mobile phones can. There were no PCs or intelligent systems, only second and third-generation systems built with logical circuits. Those days analogue computers were used in realtime applications. The systems in the 70s were not all indigenous. Some of them were imported and others were manufactured in

India by multinationals like IBM, until ECIL started manufacturing its own in the 70s itself.

In the 70s, during Mrs. Gandhi's government, post Bangladesh liberation, India had a strained relationship with the US Therefore, India made a pact with Russia (then USSR) to import hardware. Russia made a replica of the computer system IMB360 /370 series and sold it to India. In return, ASCI developed and exported software to the Russians. The quality of the mainframe was subpar; the machines were humungous in size, cranes were used to transport and install these systems.

- **Formation of CMC (Computer Maintenance Corporation) Ltd.**

There was a necessity of formation of CMC as an undertaking, during the 70s, by the Government of India for the maintenance and support of imported computers by the leading manufacturers like IBM, ICL etc., when these MNCs wound up their operations in India due to FERA regulations by the Government of India in mid 70s. Subsequently CMC played a major role in IT growth.

4.4.2 The 80s

The 80s saw the ad30vent of local computer manufacturing. Murthy emphasises the role of ECIL in hardware growth and manufacturing in the IT industry. It was in the 80s that ECIL began manufacturing full pledged indigenous computer systems of different range. ECIL was part of Bhabha Atomic Research Centre (BARC) Mumbai, under the Department of Atomic Energy and later became the Government of India undertaking.

The role of ECIL was key in hardware growth and manufacturing in the IT industry

Dr. A.S. Rao was the founding managing director of ECIL. Senior members of the Atomic Energy Establishment formed a committee for setting up a design and production facility and recommended Hyderabad as the ideal location. The objective was clear to achieve self-reliance in electronics, place India on par with developed nations, modernise Indian industry through new technology, and open up vast employment opportunities for Indian scientists and engineers. Thus, the Electronics Corporation of India Limited (ECIL) was established as a Public Sector Company under the Department of Atomic Energy on April 11, 1967, under the stewardship of Dr. A.S. Rao.

The establishment of ECIL created a pool of talent in the electronics and computers field in the Hyderabad region. ECIL has played a positive role, especially in the training of technical

talent pool. Murthy claims, "Even a diploma holder became an expert in design and development" – that was the kind of solid training given in ECIL.

The super-mini systems were built with the bit-slice microprocessor. These systems were built by various companies in the US and India. In 1983-84, Hyderabad witnessed PCs imported from the US at huge costs. The import restrictions at the time, according to Murthy, had caused sluggishness in the growth of the Indian IT story. With the rapid development of computerisation, PCs were introduced with a bus architecture (Stallings, Computer Organization and Architecture: Designing for Performance, 6th Edition, 2003). PC usage hugely increased due to its affordability. The other hardware manufacturing companies came up in the early 80s in the private sector in India like DCM, HCL, Wipro etc., producing PCs , Data Entry Systems, Minis computers etc.,

Digital communication and networking began in the late 80s with a slow network. The introduction of networks began for educational purposes with the 'Education and Research Network' (ERNET), and subsequently, in the 1990s National Informatics Centre Network (NICNET) came in (Wolcott & Goodman, 2003).

Unix (computer operating system) based machines were manufactured by ECIL, which became popular with PCs. Many new languages and web-based applications started to develop during this decade. This decade also saw the rise and fall of many companies.

Companies from the US which were at the top of their game could not sustain post that decade. To name a few, Univac and Digital, Borrows etc., were competitors to IBM, but they do not exist today. Due to the rapid growth and competition, they sold off their companies to others and were absorbed. By the end of the decade, ECIL became the leading local manufacturer in mini and super-mini computers.

4.4.2.1 Computerisation

Computerisation began with digitising examination results, this started at ASCI. ECIL set up the TDC 12 and later 312 in ASCI on a barter system. This was also done so that officers and people of the industry would visit ASCI for training and be exposed to the system, to purchase later. ASCI developed software for ECIL for a primitive system without a hard disk. Subsequently, the computerisation of the state government started. Computerisation

ASCI developed software for ECIL for a primitive system without a hard disk. Subsequently, the computerisation of the state government started.

spread to other parts and departments of the state govt. Computerisation of Intermediate exams results, EAMCET, Department of Finance and Planning began incorporating computer systems. ASCI became the national Centre for undertaking computerisation of different state governments.

Although there were rapid developments and movements for computerisation, there were a few problems. Murthy calls out the production quality back in the 70s and 80s. ECIL was a first-time manufacturer, and the resultant hardware was not reliable. Earlier IBM systems focused on high quality and reliability. With the exit of IBM due to The Foreign Exchange Regulation Act (FERA) in 1975, the availability of quality and reliable computers suffered. The Russian models were not of reliable quality, and the system(s) was not user friendly. Multiple technical issues had to be resolved at chip level. Spare part replacement was not an easy option, as parts were expensive, and import procedures were way too strict and tedious.

The system's activity increased in Hyderabad due to the availability of the mainframe at ASCI and the subsequent murmur for the need for computerisation. The transition was not smooth. There was tremendous opposition by Unions against computerisation. Murthy explains that in the initial stages of computers, the perception was that computers will take away human roles in jobs.

The system's activity increased in Hyderabad due to the availability of the mainframe at ASCI and the subsequent murmur for the need for computerisation.

The efforts and setting up of the Rangarajan committee lead to computerise the banks. Delay in computerisation of banks was due to the opposition of the unions and non-clarity of thought regarding the benefits and results.

Establishment of National Informatics center (NIC) by the Government of India, during the Rajiv Gandhi regime to cater to the needs of computerisation across the country. It gave a big boost to the computerisation in the government departments.

4.4.3 The 90s

There were monumental changes that transformed the IT sector in the 90s. The advent of the internet and the Liberalisation-Globalisation-Privatisation (LPG) reforms in the early 90s gave the domestic IT sector a boost it needed. The establishment of ERNET in 1986 for educational institutions, NICNET for inter-governmental communication & Videsh Sanchar Nigam Limited (VSNL) in 1995 made inter-networking

widely available. In the initial stages, internet connectivity was cumbersome. The quality, availability, and speed were questionable, unlike high-speed data networks today. Gradually, due to the rise in demand, improvements were made in the network quality and availability.

The other aspect spoken almost synonymous with the mention of the 90s is the Indian economic reforms. Due to the new policies, markets had opened up, and new Multi-National Corporations (MNCs) came into the country and Hyderabad. The export regulations loosened up, and the software business was at the winning end. Software Technology Parks of India (STPI) was established in 1991 by the Indian Ministry of Electronics and Information Technology to encourage, promote, and boost the export of software from India. STPI was based in Hyderabad along with other capital cities. The emergence of HITEC city and its inaugural paved the way for the success of IT, says, Murthy. The global visibility of Hyderabad grew due to the state government's ability to pursue the visit of the American President-Bill Clinton. This decade set Hyderabad into a growth spurt for the IT sector with no boundaries, figuratively, and referring to the exports.

Globalisation was positive in many aspects, but some damage was done too. According to Murthy, Globalisation has impacted ECIL-imports have hindered local demand. The cheaper imports and competition put ECIL in the backburner as a choice for hardware. Subsequently, ECIL stopped manufacturing computer systems and was limited to software.

Hyderabad would have grown to be a manufacturing hub of PC's, computer hardware, etc if not for these localisation policies in the 70s.

Murthy threw some light and delved into the self-reliance policy by Mrs. Gandhi in the 70s. Indira Gandhi was committed to self-reliance in crucial sectors like food grains, defence, and technology. Though this seemed like the sensible approach at the time, it seemed to have stagnated India's and especially Hyderabad's growth in hardware. This caused a setback of around 10-15 years for the IT boom compared to the US sans the localisation policies of the '70s. Murthy believes Hyderabad would have grown to be a manufacturing hub of PC's, computer hardware, etc. Due to these localisation policies, he believes India lost out on trade with the US, which then took the hardware manufacturing to Taiwan and China.

4.4.4 The 2000s and present scenario

Hyderabad, Murthy says, became the IT training hub of the

country. The aspect of the training was always alive in Hyderabad from the days of the Computers Society of India (CSI), which was founded in DRDL labs, Hyderabad in 1965 by one Major General Balasubramanian, and CSI, ASCI and ECIL, and other local institutes. Also, the spread of the training centres grew massively. Ameerpet, as we all know it is a hub for IT training.

People come from various states to get trained and certified in the software. This, he says, is the contribution of expertise from ECIL and other leading training institutes to the city.

The government fully embraced the penetration of computer systems, technology and their usage

About the Telangana government, Murthy calls them, "computer savvy". The government fully embraced the penetration of computer systems and their usage. Various e-governance projects were being taken up, which Murthy was a part of and contributed towards.

He emphasises the efforts of the state and central government at the time as well, for supporting and providing space to set up zones and benefits, enabling the IT sector to proceed without disruptions.

The software exports in 2020 have reached almost 1.28 lakh crore in Hyderabad, which was close to what Bangalore did as well (Govt. of Telangana, 2020).

4.5 The Bangalore vs Hyderabad debate

Murthy believes that Bangalore had been growing more than Hyderabad, as its initiation of the IT sector began earlier. Although both cities have had similar environments, with workforce capacities and cosmopolitan climate, Bangalore has had an early advantage.

The initial stages of setting up Bangalore went about a different manner in doing so. Government practices and start-up the environment was built sooner than in Hyderabad

Hyderabad's initial software development was under Andhra Pradesh Electronics Development Corporation Ltd (APEDC). The onus was on the APEDC to promote and create Hyderabad's image as the emerging IT city. The APEDC distributed pamphlets during seminars and talks promoting the land availability for software companies and IT city. Most states did similar activities to promote the IT sector in their states, but Bangalore (Karnataka) was different. The initial stages of setting up Bangalore went about a different manner in doing so. Government practices and start-up the environment was built sooner than in Hyderabad. They also had better connectivity in satellite systems, and later also internet connectivity was established early on in Bangalore.

An example would be Digital, a leading MNC that considered two options: Bangalore and Hyderabad when scouting for places to set up in India. All parameters were close, but they chose to set up in Bangalore clearly because of the climatic conditions. This was one of the conditions, but slowly Hyderabad has come at par with Bangalore and maybe even crossed it, believes Murthy.

4.6 Conclusion

The IT industry has come a long way from the time of its birth. We have learnt the hard way that India and Hyderabad missed the semiconductor manufacturing bus because of policy paralysis and the license raj. Since then, the central government has liberalised the economy, and the local governments have embraced change and have rolled out red carpets to digital entrepreneurs. Mr. Murthy and other entrepreneurs that we interviewed tell us that time has not passed for Hyderabad to give another shot at embracing hardware manufacturing.

5. A Bureaucrat's Perspective: Hyderabad's Journey to become an IT Centre

"Information Technology took off in the country in the initial years largely because government regulations were not in place and the genuine entrepreneurship and skills of the people were allowed to blossom". Sheela Bhide talks about her journey with IT as an insider from the government.

5.1 The Inception of the Industry:

The story of the growth of the IT industry in Hyderabad is a unique and fascinating one, said Bhide. It was a culmination of various factors, some of the most important being political leadership and vision, team work amongst Government officials of different departments who worked in a mission mode, inherent talent and skills of the Andhra people, a spirit of close partnership between the State Government and the IT entrepreneurs and unstinted support of Telugu NRIs IT professionals who wanted to contribute to the development of their State. The IT industry was a new chapter in the State's journey towards industrialisation.

Briefly outlining the history of the industrialisation of the State, Bhide said that when the Government of India (GoI) opened up the economy in 1991, Andhra Pradesh was at the crossroads of industrialisation. The opening up of the country's economy through Government of India's new policies focusing on

liberalisation, globalisation and deregulation of Industry and Trade, created a great deal of enthusiasm in industry circles in several States. Foreign direct investment (FDI) and transfers of technology were being encouraged, as were expansion of units to achieve economies of scale. The neighbouring states of Karnataka, Maharashtra, Tamil Nadu, and Gujarat, seizing the new opportunities, moved very quickly into the new industrial age.

Andhra Pradesh, till then, was still primarily an agrarian state. An industry presence in AP was seen largely in and around Hyderabad through public sector units like IDPL, HMT, BHEL, ECIL and many defence PSUs like BDL. The private industry started making its presence felt in the 1970's and 1980's with technocrat entrepreneurs who had studied in the US, had gained knowledge and experience of managing industrial units there and who had come back to the State to set up their own industrial units, most of them in and around Hyderabad. A few large private units were also established in the field of bulk drugs and pharmaceuticals, to some extent, as a spin off from the IDPL.

There was no separate Department for IT at that time and it was the department of industry which took the initial steps to promote the IT industry in the State.

Considering all these aspects and the country's changed economic climate, the policy makers in Government of AP wondered what strategy ought to be adopted to usher in industrialisation in the State. Bhide was the Secretary of Industries in 1995. There was no separate Department for IT at that time and it was the department of industry which took the initial steps to promote the IT industry in the State. A separate department for IT was set up a couple of years later. The process began by the industries department first studying in which sectors the Andhra people were doing well in foreign countries, and in particular, in the US where they had a large and dominant presence. The point, says Bhide, was to identify the inherent strengths and skills of the people of AP Government delegations visited USA and held discussions with representatives of the Telugu Associations and leading industrialists from Andhra Pradesh who had earned recognition for themselves in USA. It was evident that it was in the new emerging sectors such as IT, ITeS, biotechnology and life sciences, bulk drugs and pharmaceuticals, speciality chemicals and in the fields of medical and health care and diagnostics that the people from Andhra Pradesh had proved their mark.

Therefore, it was felt that the State Government should promote these new emerging sectors in the State by creating the required infrastructure, training of manpower and creating an enabling

environment for these industries. It was felt that these would attract the talent pool from abroad to come back to industrialise their state. Thus, the State Government's initial thrust was to make AP an IT-BT Hub (Information Technology & Bio-Technology Hub).

5.2 But Where Do We Begin?

The Government of India in the early 1990s had a dynamic Secretary, Department of Electronics, in Mr. N. Vittal. He launched a strategy to set up Software Technology Parks of India in all important IT cities, to provide a one stop shop for all government clearances to the IT units. Although Hyderabad was not, at that time, a significant IT centre, Mr. Vittal chose Hyderabad as one of the cities to set up an STPI.

Mr. J.A. Chowdhary (JAC), appointed as the first Director of STPI-H, presented his vision for the growth of the IT industry in Hyderabad to the officials of the State Government's Department of Industries. STPI was set up in the space provided in the Municipal building "Maitrivanam".This began a long and successful partnership between STPI and the State Government's Department of Industries initially and with the Department of Information Technology subsequently. The State Government decided to provide STPI with 10 acres of land in Madhapur and rupees one crore as an interest-free loan in 1993. Providing broad band facilities to the IT industry was the next vital step. Hyderabad, in the early 1990s, did not have internet connectivity and bandwidth enough to support the IT services by the IT companies. With JAC's contacts in the Government of India and dogged persuasion, a satellite link was sanctioned. In Jubilee Hills, right next to the MCRHRDI campus, a satellite station was built to provide line-of-sight internet connectivity. This provided Hyderabad with the fundamental infrastructure that the IT industry required.

Andhra Pradesh's basic internet infrastructure and availability of a large technical workforce were in place; now, it was time to sell the idea of Hyderabad as an IT destination to the industry. JAC suggested that Bhide should accompany him to Mumbai to market Hyderabad as an IT destination to the IT industries located in Santacruz Electronic Export Processing Zone (SEEPZ). JAC, in a lighter vein, compared themselves to medical representatives, carrying briefcases and presentations and marketing their products from door to door to the prospective buyers. As a part of this strategy, they met several companies like Oracle, Baan (ERP

company), Mahindra Tech and various others located in SEEPZ. Moving from office to office, they explained to the top managements of these companies the benefits that they would get by moving to Hyderabad. In the end, during a final general presentation to the companies located in SEEPZ on 'Why Hyderabad was an attractive IT destination", a gentleman from the audience stood up and asked a most unexpected question, 'Please tell us just one good reason why we should move to Hyderabad'. This question, coming as it did after an elaborate presentation lasting over an hour, startled and somewhat disturbed Bhide and JAC.

After the meeting was over, some of the participants were kind enough to stay back to informally and frankly discuss with Bhide and JAC the apprehensions that they had about Hyderabad as an IT centre. They pointed out that the IT industry was slightly different from other sectors. Whilelauding the sincerity and enthusiasm of the political leadership and the senior bureaucrats of the state government in promoting the IT sector in the State, they felt that it was important and, indeed, most essential, for the political leaders and the officials to look at the needs of the IT industry from the perspective of the IT entrepreneurs and the IT professionals. The main requirement of the IT industry was that of high-quality internet infrastructure and high quality, uninterrupted power supply. In those days, there were terrible power shortages in Andhra Pradesh. The state government had not invested in new power projects for several years. Without first assuring the availability of stable, high-quality power, they said, it was impossible for the state government to attract IT companies to Hyderabad. Secondly, Hyderabad did not have 5-Star hotels and was not well connected by air directly to any major cities abroad which would be a disincentive to global IT companies to move to Hyderabad. There were not many large, modern buildings in Hyderabad suitable to house IT operations of large IT companies. Most IT companies those days preferred to take on lease suitable buildings rather than construct their own buildings so that they could be asset-light and fleet-footed to move their operations wherever there were business opportunities. Furthermore, they said that smaller IT companies would not have the cost margins to invest in high-end infrastructure. Those days, high quality housing by way of gated colonies were also not in plenty in Hyderabad to house the senior IT professionals.

The workforce advantage of Andhra Pradesh, too, was analysed. Although AP professionals were known for their IT skills, they were mostly based in Chennai and Bangalore rather than in Hyderabad. Hyderabad, unlike Chennai and Mumbai, lacked well-reputed technical and management institutes like IITs and IIMs. Bangalore had the Indian Institute of Science (IISC). Moreover, there was a severe lack of quality educational institutions in Hyderabad both at the school and college levels. IT professionals preferred cities where high quality education was available for their children. The lack of social infrastructure in Hyderabad was also brought up. They said that IT professionals had long and arduous working hours and needed to relax and socialize in clubs and pubs at the end of the work day. AP at the time had imposed prohibition. There were not many social clubs or golf courses in Hyderabad those days and it was very difficult for IT professionals, who had relocated themselves in Hyderabad, to get membership in the few existing clubs. The social environment in Hyderabad, they pointed out, was certainly not conducive to attract young, upwardly mobile tech professionals.

Therefore, at the end of the 'marketing trip', there were some important takeaways for Bhide and JAC. The State's political and bureaucratic system needed to do much more homework to understand the needs of the IT industry from the perspective of the IT entrepreneurs and professionals in order to create a conducive environment for the IT industry to be attracted to Hyderabad. JAC and Bhide briefed the then Chief Minister about the outcome of their visit to Mumbai's SEEPZ and the interactions they had with the leading IT companies. This spurred a serious effort on the part of the political leadership with full support of the senior bureaucrats to deeply introspect the existing policies towards industrial promotion and to re-engineer the entire functioning of the State Government in order to create "an industry-friendly" environment in every aspect of governance.

5.3 Making the Wrongs of Hyderabad Right

The then Chief Minister of AP, was a man with a vision. As Bhide mentioned earlier, it was his vision to make Hyderabad an IT-B.T. Hub. During the then Chief Minister's regime, there was an effort to re-engineer the entire government, its policies and its functioning. As an example of his drive, he called himself the CEO of AP. He wanted to project an image that the State Government was as goal-oriented and efficient as the private

sector. Electronic attendance recording was introduced in all government offices. The Chief Minister himself would log in and log out when he came to office. So did all the ministers and officials. All government files were digitized and decisions were taken at all levels in e-files. This was a major cultural transformation for all the government officials. The time taken at the level of each officer for clearing a file was recorded and monitored and the system of single window clearances was introduced.

The government began a multi-pronged strategy to invest in infrastructure, especially in the power sector

All ministers and officers were mandated to undergo training in the use of computers and emails were allotted to all. All this created a buzz around the country of the AP government being a result-oriented government. AP government, with the support of Department for International Development of the Government of United Kingdom (DFID) and the World Bank set up in 2001 the Centre for Good Governance in Hyderabad. The objective of this Centre was to promote and guide the governance reforms in the country and to train officials from all over the country in principles of good governance through the harnessing of technology and putting in place people-centric governance practices.

The government began a multi-pronged strategy to invest in infrastructure, especially in the power sector. The PPP model was proposed for building roadways, power plants, bridges and airports. The airport in Hyderabad was privatised and international connectivity was established. Etihad was the first airline to start its operations in Hyderabad, taking advantage of the large passenger and cargo traffic to the Middle East. The prohibitions and restrictions on social gatherings and opening of clubs and pubs were lifted. Prohibition was dismantled. Thus, the effort of the Industries Department to promote industrialisation of the State, in particular, IT and Biotechnology, was fully supported by all departments of the state government across the board. A comprehensive strategy was launched by the Chief Minister to project a new image of the State as the most attractive destination for industries and to project Hyderabad as 'The most happening place'.

5.4 Setting up the First IT Park in the Country

While changes in government policies to accommodate the needs of the IT industry were being made, it was soon realised that Hyderabad city would take a very long time to achieve the

standards of infrastructure, cosmopolitan social environment and technical manpower that were already in place since several decades in Bangalore, Chennai and Mumbai. In a discussion with S.R.Govindrajan, the then Special Chief Secretary, Industries, Bhide suggested setting up of an IT Park., arguing that the setting up of a specific IT zone would considerably accelerate the growth process and create specialised infrastructure in an integrated manner and foster an over-all conducive environment required by the IT companies. The idea was approved by the policial leaders and senior officials immediately, and Bhide went about looking for suitable vacant government land around Hyderabad. She found that Madhapur village and the villages beyond Madhapur to be the most suitable to set up an IT Park because of the vast area of barren, unutilised land available there without much habitation.

The question arose amidst these discussions regarding the IT Park, whether the government would be the best agency to provide quality infrastructure for the IT sector or whether it would be best left to specialized private developers who were experienced in providing such bespoke facilities for the IT industry. The Andhra Pradesh Industrial Infrastructure Corporation Ltd (APIIC) was given this project, but there were soon doubts whether it could deliver high-quality infrastructure required by the industry and whether it could maintain it thereafter. A consensus was reached at the policy level that the State Government should adopt the Public-Private Partnership model wherein the State Government would provide basic infrastructure to serve the IT Park such as approach roads, electric sub-stations, water supply etc. but the rest of the infrastructure within the park would be outsourced to a private developer. Mr.. Rentala Chandrashekar, who was the MD of APIIC, was given the go-ahead to initiate an open bidding process to finalise the selection of a private developer in a PPP model. Through this process, L&T was selected as the PPP developer to take forward the task of building the infrastructure in the proposed IT Park. The Chairman of L&T at that time was Mr.. Ramakrishna who belonged to Andhra Pradesh and he was keen to contribute something to the development of the State.

The PPP model was adopted with consensus regarding the setting up of IT Parks.

Some portion of the ten acres given to the STPI in Madhapur was sanctioned to the L&T to construct office space for IT companies and to provide the required supporting infrastructure. The Cyber Towers, a tall imposing circular building came up within a short period of 14 months on this piece of land. L&T called it Hitech

City. A marketing opportunity came along when a Korean delegation arrived in Hyderabad around the same time. They were taken around Hyderabad to show the historic parts of the city. Once Charminar, Golconda and the pearls market were accounted for, they were taken to what the State proudly called the Hitec City. It was a contrasting sight at Madhapur. On the one hand, there were rocks, boulders and thorny bushes-in essence, just a drab and barren wilderness, says Bhide. On the other was the multi-storeyed Cyber Towers building standing most splendidly in the midst of this barren landscape. The Korean delegation asked a valid but embarrassing question, "Does one building make it a Hitech City?" Bhide says that they were a little embarrassed with the question and answered in an undertone that this was only the beginning of the project of a Hitech City and more development lay ahead.

5.5 Setting up Technical Institutes of Repute

In the mid-1990's, Andhra Pradesh did not have good quality technical or management institutes. Therefore, those days, most of the bright, young students of the State left for Chennai, Bangalore or Mumbai for joining technical and management courses and many stayed on there for employment. Hyderabad did not have well-reputed technical or management schools like IITs and IIMs. Then, by a stroke of good fortune and pro-active steps and quick decision-making on the part of the State Government, Hyderabad got the Indian School of Business (ISB). It was envisaged to be the best Business School in Asia meeting international standards with affiliation to the world's most renowned, marquee Business Schools such as Kellog School of Management, the Wharton School, London Business School, MIT Sloan School of Management and the Fletcher School of Law and Diplomacy at the Tuft's University. Hyderabad was not the original destination for this project. Mr. Deepak Parekh, Chairman of HDFC, along with a few internationally recognized consultants such as Rajat Gupta and Anil Kumar of Mckinsey company and some leading Indian industrialists had decided in 1996 to set up a business school of international standards in Maharashtra. They were originally planning to set up the Business School in Mumbai and approached the Government of Maharashtra for allotment of suitable land. Bhide says this pitch faced a problem. Government of Maharashtra imposed a condition for allotting land for the business school. It demanded that atleast 20% of the seats for admission be reserved for the

Hyderabad got the Indian School of Business which was soon recognised as one of the leading Business Schools of India.

Government of Maharashtra to be filled by them at their discretion. While these negotiations were going on, Government of AP, on hearing of the initiative, offered to them land free of cost and without any conditions. On hearing of this offer, a team of industrialists lead by Rajat Gupta immediately agreed to visit Hyderabad. Bhide and a team of senior officers from the industries and education departments accompanied Rajat Gupta and his team to the proposed site for the business school. When the team was shown 260 acres of land in Gachibowli, an area being developed for new IT units, they most readily accepted the offer. They said that they were impressed with the government's quick decision-making and generous support to provide, not only the land, but also basic infrastructure such as approach roads, water supply and electricity. Thus, Hyderabad got the Indian School of Business which was soon recognised as one of the leading Business Schools of India.

The International Institute of Information Technology (IIIT) was set up in Hyderabad in 1998 under the public-private partnership model by the Department of Human Resource Development of Government of Andhra Pradesh and NASSCOM. The State Government handed over, as its contribution, the land that had been earmarked and the buildings that had been constructed in Gachibowli for the Collectorate of Hyderabad to the new institution. The IIIT was set up with the objective of training manpower to serve the fast expanding IT industry in Hyderabad and also to undertake research in the fields of computer science, electronics and communications, computer-aided structural engineering and other inter-disciplinary applications. IBM set up its training centre in Hyderabad. IIIT and the IBM Training Centre overcame, to a large extent, the lack of high quality technical institutes in Hyderabad.

The International Institute of Information Technology (IIIT) was set up in Hyderabad in 1998 under the public-private partnership model

5.6 Upgrading Hyderabad as a Modern, Cosmopolitan Metropolis

Hyderabad until the late 1980's was a somewhat laid back city with a gentle pace of life. Chief Minister was keen to change the city's image and make it a dynamic, cosmopolitan city. Bhide mentions the initiatives taken by the State Government to privatise the city's sanitation, to widen the city's roads and to plant trees along the avenues so as to live up to the slogan of a "Clean and Green Hyderabad". People were impressed when private companies, engaged for the sanitation task, deployed cleaning personnel during the night, wearing reflective gear. It was an

innovative step those days, which no other city had done. These efforts paid huge dividends because Hyderabad won the 'Cleanest City Award' for successive years from the Central Government.

Investments in social infrastructure were given focus as well. The city did not have any 5-star hotels or any large international chain of hotels. Although not directly part of manufacturing industries, these were supporting service industries which were needed for the growth of the IT sector in Hyderabad. One such story Bhide narrates is how the TAJ group of hotels decided to set up a 5-star hotel in Hyderabad. The management of the group was initially sceptical about the viability of setting up a 5-star hotel in Hyderabad and was keen to know what the state government's plans were for industrial development in and around Hyderabad. Bhide was invited to make a presentation to the top brass of the Business Development team of the TAJ chain of Hotels. She explained to them the State Government's initiatives to develop industries and, in particular, the IT and the Biotechnology industries, in Hyderabad and how the prospects of Indian and international executives visiting Hyderabad on business trips would brighten considerably in the near future. The Team, on hearing of the State Government's plans to make a major thrust for the rapid industrialisation of the State, finally decided to take the plunge and the TAJ hotel was set up in Banjara Hills. Soon other leading hotel chains followed and set up 5-star hotels in Hyderabad.

5.7 Chief Minister's visit to Japan-Malaysia-Singapore

Bhide calls the Chief Minister's visit to Japan as one of the most significant events that took place in Hyderabad's journey to become an IT centre. By the late 1990's, the Japanese leaders had heard about Chief Minister and the IT revolution in India and about his initiatives to develop the IT industry in Hyderabad. The Japanese believed that they had been in some ways lagging behind in the world IT revolution. Japan was a world leader in core electronics hardware manufacturing industry but they believed that they had been left behind in the development of software. For this reason, they invited Chief Minister, along with a team of officials from the industry department, to visit Japan and sought to establish a collaboration with the state government and the IT software industry of Hyderabad. Chief Minister made a presentation to the Japanese Prime Minister, senior cabinet ministers, top bureaucrats and leading representatives of the Japanese Electronics Industry about the recent growth of

Hyderabad's IT industry and his plans to develop it further in the future. Chief Minister's emphatic proposition that "Japan has the hardware and Hyderbad has the software and, hence, there was a tremendous opportunity for collaboration between the two", left the Japanese impressed. He invited Japanese companies to invest in Andhra Pradesh and met some of the leading industry entrepreneurs one on one. Several Japanese delegates visited India and, in particular Hyderabad, after that successful visit of the Chief Minister to Japan.

Malaysia was one of the stops on the way back from Japan. Malaysia had already developed an IT corridor, which consisted of many towns spreading across several acres of land. The infrastructure and the IT industry were being rapidly expanding in the area near Kuala Lumpur. These visits, especially to Malaysia, increased the drive of the State Government to move quickly from the single building of Cyber Towers to planning the development of a full-fledged IT township in Madhapur and surrounding villages. APIIC took over the Government lands in the Madhapur area, and started to develop infrastructure for the IT industry. The private lands in and around Madhapur were also bought by private real estate developers and IT companies alike. They started developing infrastructure to meet the needs of the IT industry and soon private ancillary businesses started to establish themselves in that area. Major IT companies, both Indian and international, such as Wipro, Microsoft, TCS, Infosys, Cognizant Technology Solutions, Baan, Oracle India, HCL, Cyient, Genpact, Accenture, Honeywell IT Solutions, Hewlett Packard India Enterprises, SIS Software India and so on set up their operations in Hyderabad.

Satyam, promoted by an Andhra entrepreneur, became the first Andhra IT company to join the big league of Indian IT companies.

5.8 Abolishing the Professional Tax on IT Professionals

There was a widespread criticism amongst IT professionals that Andhra Pradesh imposed a Professional Tax on them which was not in existence in any other state. On coming to know this dissatisfaction with the professional tax amongst the IT professionals, Bhide decided to persuade the finance department officials to withdrawn this tax since the income from it to the state government was insignificant anyway. The Chief Minister fully supported this move. The inauguration of the office of Intergraph, a major American IT company, in Hyderabad was slated to be held on a particular day and Bhide was aware that a large

number of IT professionals would be present in the audience at this inauguration ceremony. She took the file, in which the withdrawal of the professional tax was proposed, personally from office to office i.e. the offices of the industries minister, Finance Secretary, Chief Secretary and then to the Chief Minister, in a period of just a few hours to obtain the approval of the proposal for the withdrawal of the Tax. The government order (G.O.) was issued just a few minutes before the inauguration of the Intergraph office was to take place. Bhide took the G.O. from the Finance Department and rushed to the inauguration ceremony. In her speech she announced the issue of the G.O. withdrawing the professional tax by the Government of Andhra Pradesh. This announcement was followed by a round of loud applause from the IT professionals who were present in large numbers in the audience. Bhide feels that this was just one of the many incidents which contributed to the creation of an atmosphere of trust between the IT industry and the State Government. There was an increasing belief amongst IT professionals that the State Government was sincerely trying to be friendly and positive towards them.

The new IT hub of the city was names 'Cyberabad'.

Once the area began to develop as an IT hub, the Chief Minister decided to call the new area as "Cyberabad", a nomenclature which attracted a lot of attention in the media. The area soon saw a spate of developmental activities as the IT industry of Hyderabad finally took wings.

5.9 The Effect of the Visits of the Two Bills

It was in March 1997 that Bill Gates, co-promoter and Chairman and CEO of Microsoft visited India. A visit to Hyderabad was not included in his itinerary. However, when the then Chief Minister, heard of the proposed visit, he saw it as a great opportunity to project before him Hyderabad as an IThub. His team sought time for a brief 20-minute presentation on Hyderabad to be made to him by Chief Minister himself in New Delhi. Bill Gates confirmed the appointment for the Chief Minister. The presentation went off very well and Bill Gates appreciated the sincerity and the clarity of thought of the Chief Minister. He decided to send a team to Hyderabad to assess the viability of setting up Microsoft's Development Centre in the city.

Soon after Bill Gates' visit to India, a Microsoft team lead by Mr.. Somasundaram, visited Hyderabad to assess the city for setting up the development centre. The team, thereafter, visited Chennai. Comparing the infrastructure and the software talent

pool available in both the cities, the team recommended that the Development Centre be set up in Chennai. Bhide says Chief Minister was unwilling to accept this recommendation. He was determined to get Microsoft to set up the Development Centre in Hyderabad. He reached out to several Andhra NRIs who had built high reputations in the industry in USA to promote Hyderabad as a suitable centre for software development and to persuade the Microsoft top management to review the recommendation of the team led by Somasundarm. Bill Gates agreed to send a second team to visit India to assess again various cities to locate Microsoft's development centre. The second team came to India and visited various cities, including Hyderabad. This time, the Microsoft Team recommended Hyderabad and Microsoft's largest development centre outside USA was set up in Hyderabad.

The Microsoft Team recommended Hyderabad and Microsoft's largest development centre outside USA

The next milestone was the visit of President Bill Clinton to India in March 2000. President Clinton came with a barrage of top-class global companies and the international media with him. Chief Minister was eager to draw Clinton's attention towards Hyderabad. He knew that a visit by the US President to Hyderabad would put the city on the global radar. Bhide says, once again, all efforts were made by the Chief Minister and senior Government officials to bring Clinton to Hyderabad. The US. Ambassador who was finalizing the itinerary of the President informed that it would not be possible to include a visit to Hyderabad as the schedule was already very tight and no additional programs could possibly be fitted in. However, as a result of continued persistence from the Chief Minister's office, the Ambassador obliged and invited the Chief Minister to join a private dinner party hosted by him for the President. A few moments alone with President Clinton was what the Ambassador promised the Chief Minister. Bhide says President Clinton was impressed with the presentation made by the Chief Minister and he agreed to visit Hyderabad.

In Hyderabad, a program was arranged for President Clinton to visit Hitech City. The large imposing corridors of the Cyber Towers were filled with leaders of the IT industry and the media, both national and international. Chief Minister then, once again, presented to President Bill Clinton the development of Hyderabad as an IT centre; this caught the world's eyes. He emphasized the fact that one-third of IT professionals in USA were Indians and, out of these, 26% were from Andhra Pradesh.

The American media widely covered this visit of the President to Hyderabad. Finally, Hyderabad had arrived on the global stage as an IT hub.

5.10 "Information Technology took off in the initial years largely because of the absence of government regulations"

Bhide says, “One important reason why information technology took off in the country in the initial years was the fact that there were no government regulations in place.” Government officials were not yet exposed to the information technology industry and were not aware of what rules and regulations were required to be put in place. She says, India was emerging out of the licence and permit raj, and the IT revolution happened at the right time to reap the benefits of the new spirit of liberalisation that was sweeping the corridors of power. Bhide observed that the IT industry was doing far better in these initial years of liberalisation than other traditional manufacturing industries in India, so much so, that even an advanced country like Japan thought it had something to learn from India. In the late 1990’s, the Y2K problem presented a great opportunity for Indian IT companies to offer the services of their IT professionals to set right computers in offices the world over in order to avert this impending disaster.

The IT industry developed its own norms and the industry association, the National Association of Software and Service Companies (NASSCOM), set up in 1988, provided a forum to the leaders of the nascent industry to discuss issues and resolve problems within the industry circles. It also reinforced a spirit of camaraderie and common goals. NASSCOM Presidents like Dewang Mehta, Kiran Karnik and Som Mittal gave leadership to the industry entrepreneurs and professionals. The Hyderabad Software Exporters’ Association (HYSEA) was set up under the leadership of Mr.. B.V. R. Mohan Reddy, CMD of Infotech Enterprises. HYSEA encouraged the Hyderabad IT companies to globalise their operations. There was little dependence on government and the industry leaders were imbued with a spirit of confidence that they could become global players on their own inherent strengths.

5.11 Conclusion

In an economy coming out of socialism and the license and permit raj, political leaders and senior bureaucrats in Andhra Pradesh approached their relationship with the industry with a new spirit

of promotion, development and partnership rather than with an approach of regulation and control. When a Government's political and bureaucratic leadership catalyses the private industry's entrepreneurial spirit, a resounding example of the tremendous success that can be achieved is the IT industry of Hyderabad. The State Government became an enabler of new enterprises and the true entrepreneurship spirit and the latent talent of the people were allowed to blossom. This was the driving spirit of Hyderabad's IT journey, says Bhide.

6. A Bureaucrats Perspective: Crafting an IT-HUB

6.1 An insider's view of Hyderabad's IT wave

"It is not only getting the right idea but getting it at the right time."

Mr.. Renatla Chandrashekar believes it was a variety of intentional and non-intentional factors that helped Hyderabad ride and enjoy the IT wave. Through his years of service in the government of Andhra Pradesh and being India's first IT secretary , he gives more detail of how Hyderabad became the global technology hub we all know today.

6.2 Opening up of the economy and establishing the STPIs

The Software Technology Parks of India was set up in 1991. Seven STPIs were set up in different locations all across the country; one of them was Hyderabad. The STPI in Hyderabad was initially established in a small, rented building called Maithrivnam in Ameerpet. Chandrashekar says that by today's standard of infrastructure and glamour of IT parks, one could pass by the rented space (Maithrivanam) and miss it with a blink! Chandrashekar was part of the Government of India (GoI) as director and joint secretary. Part of his job was to deal with various geographies and people around the world. Soon enough, he took up the promotion of the electronics and software industry. He says, funnily enough, one of the only reasons he was given this responsibility was his computer science degree, giving him a slight edge or understanding of the sector's overall working.

During this period, in the 90s, then Prime Minister Mr..P.V. Narasimha Murthy and Finance Minister Mr. Manmohan Singh brought about the economic reforms. Before the opening up of the economy, the license raj was towering over the IT industry. Everything required a license, and the government decided the capacities and quotas Chandrashekar shares a story about Narayan Murthy, the head and founder of the tech giant Infosys. During the license raj regime, he says,

Murthy had to plead with the GoI to import a computer with a 40 megabit storage (computer storage); the response was, why was so much storage required? When asked for import licenses for a particular computer processor, he was asked why he needed such a powerful processor. The anecdote says Chandrashekar displays the bureaucrats' lack of knowledge and openness who knew close to nothing about technology. The lack of freedom and support by authorities, he says, made it a difficult place to do technology business.

Selling India as an IT destination to the world was a mighty task. Chandrashekar went on to say that to sell the Indian IT industry, and one had first to sell the whole of India. Eighty per cent of presentation pitches made to global investors explained India's potential, why India is the next big thing for IT, why its computer industry was worth doing business with and then getting down to individual company abilities. At that time, the task of selling IT in India spread across all those dealing with and in the IT industry.

Eighty per cent of presentation pitches made to global investors explained India's potential, why India is the next big thing for IT.

Many things came together, including a good team, hard work, proactive and visionary leadership, which enabled the city to ride the way it did. The opportunity aside, it was also a question of timing; it was getting the right idea and getting it at the right time. The Indian economy had opened up to the private sector with the advent of the economic reforms of 1991. The IT industry was presented with an excellent opportunity to develop the STPI scheme, which the government drove. It was due to several individual efforts as well, and one such was by Mr. Vittal (the secretary at the time), who drove the movement, as he was in close consultation with the IT sector. He realised the need for investments and the scope of growth in the IT industry.

6.3 The Y2K Doom

Though it may seem laughable today, it was considered a huge issue worldwide, back in the day, Y2K was assumed to be the doom of the computer world. Chandrashekar says this was partly because of clever marketing, partly because of the media role and hype, partly due to the then fledgeling Indian IT industry and partly because of fact. The fear loomed across the world that all the computers could come crashing down at midnight on December 31 1999. And thus, born was a desperate search for IT professionals with skills who could help rewrite the code, setting right the impending digital doom at the dawn of the new millennia. It was then the world discovered India's IT industry.

6.4 NASSCOM

With a very young and dynamic leadership, the National Association of Software and Service Companies (NASSCOM) was born in the early 90s, just before the economic reforms. A charismatic leader in the post of executive director (President) was Mr.. Dewang Mehta. Chandrashekar says he travelled relentlessly worldwide, spreading the word about the Indian IT industry. He stoked up the Y2K issue and redirected the world's attention to India and its workforce resource availability to solve this global crisis.

6.5 Hyderabad's shortcomings as a city aiming to be a global IT-HUB

Hyderabad was part of this global IT opportunity presented to it and had its shortcomings. It had no claims of excellent or even good infrastructure, including social and industry (IT) structures. Hyderabad did not possess anything close to an ideal or a vibrant alternative and destination to move. When we go back in time and view Hyderabad, Chandrashekar says there were no excellent educational institutions in Hyderabad's kitty. It was not home to the best schools or the IITs and the IIMs. In terms of social infrastructure, he says, the culture of bars and pubs and the social environment were not attractive. To market Hyderabad as an IT-Hub with these drawbacks made it a difficult pitch to the world.

6.6 CM's vision

The Former C.M. of Andhra Pradesh (united), was a man who envisioned Hyderabad as a global IT- Hub. Chandrashekar gives due credit to the then CM for recognising the value of the opportunity that had come. Along with a vision to create an IT-Hub, it needed a team to assess the sector's scenario to translate potential chance into reality. Chandrashekar says the CM's vision enthused the IT team that he too was part of. Put together; the team were convinced of the IT opportunity. He says, the IT team knew they were at the brink of altering the state's economic history, which gave them energy and the willingness to work hard; nobody asked for their effort, he says, it was voluntary.

Chandrashekar firmly believes it was a collective effort by many individuals that put together all the moving parts. He went on to mention a few key members of this IT team he had referred. Mr. Randeep Sudan was the then additional secretary to the CM of AP (united). He, on behalf of the CM, would market the viability of the state. Sudan would follow up with companies that came to

meet the CM out of curiosity back then; there was talk about Hyderabad though it did not have much to show itself. He puts it interestingly; he said it was Mr. Sudan's job to attract the 'big fish (companies) and send it our (team) way, and once they did, it was the team's job to ensure it never got away. Another member he mentions is Mr. Srivatsa Krishna, who was responsible for outreach. Chandrashekar commends the work done by Mr. Krishna in reaching out to IT companies worldwide to persuade them to invest and set up in Hyderabad. He mentions explicitly Mr. Krishna's approach, which had a kind of doggedness that companies had not seen any private sector players pursue them, let alone a government official. And of course, Mr. J.A.Chowdary a key driver for STPI in Hyderabad.

6.7 The pitch was good, but what about the quality of the product?

The city was being pitched to global investors and companies left-right and centre as a destination they must visit and set up shop. But as Chandrashekar mentioned, Hyderabad lacked on various fronts. He says significant elements that needed work were human resource and Infrastructure.

6.7.1 Human Resource

The world was in desperate need of human resources for IT, and India was one nation that had it in abundance. Moreover, one out of every four IT professionals in India was from Andhra Pradesh (united). It made logical sense for international companies to go to the workforce, i.e., AP, rather than any other place in the country and have the workforce move. Talking about the workforce and the IT population, Chandrashekar pointed out that in the 90s, there were no good higher education institutions; Hyderabad had a paucity of them. The professional's quality depended on education, thus making it crucial to the overall growth story.

A decision was made to set up the IIIT Hyderabad to provide high-end training and industry-ready skills. Industry experts were sent an invite to help chalk out a plan and offer necessary training pieces. The project was all set, but the question arose regarding where to set the IIIT campus? Chandrashekar says that there was an opportunity that came their way where the Headquarters for the new district collectorate and the district court was constructed, which was idle. This newly built premises lay empty as there was opposition raised regarding the location; how could the district headquarters be on an extreme side of the city? It would cause inconvenience for people from other parts. This readily

constructed idle infrastructure proved to be the campus of the newly formed IIIT Hyderabad. He says IIIT used a part of this campus, and companies used it to set up skill development schools. The first company that set up its skill development school on the IIIT campus was IBM. IBM set up an enormous school around 16000 square feet and a state-of-the-art skill development centre. Onlookers of this new campus were impressed by the infrastructure, the quality; they were not concerned about who was involved and who built it.

6.7.2 Infrastructure

The other side of the coin that needed addressing was the infrastructure development for the IT industry. Chandrashekar was the Chairman and Managing Director of Andhra Pradesh Industrial Infrastructure Corporation (APIIC). The STPI was allotted a five acre land parcel on Mr.. JAC's persuasion, where the HITEC city is now situated. The reality at the time was, Mr.. JAC had no money to build infrastructure but only to provide facilitation and services. At the same time, the APIIC had some money, when was not a lot. Judging by this situation, Chandrashekar realised there was a need to create quality infrastructure. However, the public sector and government, with all their limitations and procedural lags, are not necessarily the best place to look for high-quality infrastructure orto depend on making commercial decisions. There were varied requirements for infrastructure in the industry at the time. Small companies located in Maitrivanam were only concerned about the cost; for them, affordability was the key. Larger Indian IT companies expected good quality infrastructure, not anything fancy but good quality. The last ones, the MNC's, expected the quality of infrastructure they would get in most developed nations. There were wide-ranging expectations that required balancing. It required a decision on cost-the quality of infrastructure- and the business element. He realised it was not the Public sector's cup of tea; therefore, a better way to do it was through the Public-Private-Partnership (PPP) model.

6.7.2.1 The PPP Way

Involving the APIIC to build and manage dealings with companies would have been a task, says Mr.. Chnadrashekar. Therefore, a public-private-partnership with Larsen and Toubro as a partner was made. It was a unique partnership where all the investment made by L&T, and the land was the only contribution by the government. L&T took some three months'

time to put together a plan and another three months to start working on it. Chandrashekar recalls HITEC city as land with rocks and boulders and grass, baffled at the thought of imagining this area as the IT-Hub.

L&T started their work and were only excavating for three months. There were no issues so far, but all problems began once the construction rose above the surface. There were allegations about cost and malpractices. There were questions about why L&T was chosen and given the contract at such a high price when other bidders were willing to negotiate at lower prices. Amidst all these allegations and questions, they completely missed the point that there was absolutely no government money involved. L&T, the company itself, made all the investment. It turned into a public debate that was difficult to argue with sense. A stir created where Public Interest Litigations were filed, the opposition party in the state of AP (united) raised questions. The media raised the issue as well, seeking answers and termination of this PPP project. 60-70 per cent of his time says Chandrashekar went into dealing with all this drama more than the primary substance.

The APIIC team, he says, had a good team that successfully insulated the company (L&T) from external pressures to avoid disruptions in work. To fight all these cases that had come up, for the AP government was Attorney gen K.K. Venugopal, APIIC had hired Mr. Gopal Subramaniam, and L&T had hired Mr. Shanti Bhushan, all big guns, says Chandrashekar were involved another side was Mr. Subramaniam Swamy. They were able to ward off the legal challenge; the next battle to win was with the media. So, the team ran a media campaign to lay all the facts transparently in the press. Chandrashekar says he was confident about this campaign's after effect and how the explanation would set the record straight. The media wanted to know the nitty-gritty of the contract and the terms in it. The state team agreed for the same but on one condition that they would be allowed inside the APIIC office and take a look at the contract and not copy and circulate it, to decide for themselves what was the truth. The media stopped hounding the government and the project post this meeting; everything got on board.

The round building, which was the first to be built in HITEC city, came as a culture shock in Hyderabad. Nobody in Hyderabad had witnessed this construction pace; one floor of 55 thousand sq. feet was made every 11 days. Hyderabad had never seen anything like

this; the other five-storied or six had taken 10 -11 years to build. They were having a professional company coming in, and stepping up the game made a huge impact. It helped project Hyderabad, where it meant business. It gave out the impression that it was a city where there are professionals who market their product well and follow up with actions. Companies were happy to negotiate their real estate arrangements with a company like L&T rather than deal with the state government, which is always a problem for both parties, he says.

6.8 Hyderabad's transformation as a city – not just a turnover of the IT industry

Hyderabad was regarded as a reasonably laid-back city, where people were not very time conscious. Chandrashekar provides an anecdote to illustrate the laid-back attitude; he says, in Hyderbad, when asked regarding a task or requirement to know when it would be ready, the typical response, with absolutely no urgency, would be a few days later ("Kamm kab hota? Parson").

There have been work culture externalities that the growth of the IT industry has caused. A relaxed or rather lazy city to the hustling bustling transformation. The government put in effort in improving the city itself – the parks, the roads, beautification of the city and overall development. IT professionals would travel and bring back their experiences with them. The IT industry provided direct employment and even better indirect employment.

6.9 Hyderabad's advantage: Continued Administration and Government support throughout the years

Hyderabad in the 2000s had become a popular destination for IT but not as big as Bangalore but bigger than Tamil Nadu, which was no small measure, says Chandrashekar.

6.9.1 Hyderabad vs Bangalore

The then IT secretary of Karnataka and Chandrashekar had a cordial relationship: they kept in touch and often discussed the rivalry between two cities. He says Bangalore remains ahead of Hyderabad even today. The total volume is more significant in Bangalore, but Hyderabad is still the second-largest IT city in the country and becomes a favourite destination.

Bangalore advantage – He says the climate was an added edge for Bangalore, which was better than Hyderabad. He believes that the nature of the IT sector is such that strength begets strength (Heinze, et al., 2018). Once high-quality human resources are

established, then an ecosystem is built around it—a readily available workforce for multiple requirements. Bangalore is preferred for its industry ecosystem, not so much because of administration and government support.

Hallmark of Hyderabad - Hyderabad has always had a proactive and supportive administration, which has, time and again, going out of the way to make things happen. Chandrashekar recalls meeting company heads and taking them out for lunch and paid the expenses; the corporates were not at all used to this behaviour; they were shocked!

6.9.2 Transformations

Hyderabad is now heading towards the goal set to become an IT-Hub. The turnover crossing over one lakh crores. And all of these changes took place in only 20 years. Usually, such initiatives suffer due to a change in political power. The surprising fact that each successive government carried it out with the same vigour and effort. Post previous government, the new Congress government came into force with a CM who did not project himself as too tech-friendly, but this was his answer to his team when asked if these initiatives should be continued "who asked you to stop?". This immediately sent a message across to the whole bureaucracy regarding his government's stance.

6.9.3 T.S. formation

A government's role in the development of Industry is akin to that of 'wind beneath the wings'.

The political uncertainty, some violence leading up to the formation of the new state of Telangana saw a hiatus in the growth of IT but post-formation says Chandrashekar. Mr. KTR, the IT ministers' efforts to push TS and Hyderabad have been remarkable. Hyderabad, under this administration and overall fairs well compared to other states in terms of cost of infrastructure, social life, professional life, educational institutions quality and the overall quality of life.

6.10 Conclusion

Chandrashekar says that a government's role in the development of Industry is akin to that of 'wind beneath the wings'. One of the most significant conclusions from his experience is that democratisation of governance works wonders. Between the erstwhile AP or present-day Telangana, one needs to note that the miracle of IT happened in Hyderabad and nowhere else. It happened in a place where people that make and implement policy are at a reachable distance from the designated area of business. Private enterprise was nimbly used as a tool by the state

to turnkey surplus and enable a flood-of-opportunity. Irrespective of the party or political environment, since the inception of the IT industry in the late 1990s, there has been a candid, long-enduring symbiosis between the state and private enterprise.

7. Mapping Hyderabad's IT expedition

7.1 Creating IT market of present-day Hyderabad

Mr.. J.A. Chowdary (JAC), being the foremost propagator of the industry in its nascent stage, shared his contributions and observations of global IT city of Hyderabad today.

7.2 IT. Infrastructure

The journey of IT industry that ventured on in Hyderabad initially had a few foundation stages. Mr. JAC, an Indian bureaucrat, was pushing forth the setting up of separate space for the IT companies to work out. He recalls having a strenuous time looking for a suitable location and an office space to incubate the technology companies in their nascent stages. After much effort, he chanced upon a new building being operated by the HUDA (Hyderabad Urban Development Association) in Ameerpet. The Maitrivanam building was looking to be occupied, and Mr.. JAC locked in on the opportunity. This building was then occupied by the budding technology business. That is how India's first successful business incubator was created, says Mr.. JAC. He says the Maitrivanam model of incubator to this day stands as one of India's most successful.

The Dr. Marri Channa Reddy Human Resource Development Institute of Telangana (MCRHRDI) was situated at a vantage point for the line-of-sight connection to be viable. Soon, the A.P (united) government provided him with land beside the institute to set up a satellite station.

The top requirement of an IT incubator would be the need for communication networks. To establish internet connectivity around the city, a line-of-sight communication was required (an internet connection needed to see the antenna,) it would take/send the signal to operate. Therefore, the requirement was simple, from/to the Ameerpet building, there needed to be a negligible aerial obstruction for the antennas to transmit signals with ease. Unlike today, where data is the norm of the day and every region can be found on a map on your phone, a physical survey of the potential areas was required. After much searching, JAC found that the Dr. Marri Channa Reddy Human Resource Development Institute of Telangana (MCRHRDI) is situated at a vantage point for the line-of-sight connection to be viable. Soon, the A.P (united) government provided him with land beside the institute to set up a satellite station.

All companies part of the incubator that went on to become prominent, they were either acquired by MNC's and went on to get listed in NASDAQ.

Talking about procedural aspects of the IT sector in the 90s in Hyderabad, Mr. JAC described it as "single-window-clearance" by him and his office for IT industry. Although the issue for space was solved, occupancy now became a problem. Mr. JAC narrates the instances where the Maitrivanam building lay empty for months at a stretch as there were not many takers. An eight storied building for IT companies seemed a bit much, according to officials in Delhi (HQ), and he was asked to forgo the space to take up a floor or so, which would be sufficient considering the requirement at the time.

7.3 Training the workforce

Having created communication networks and an IT zone in Ameerpet, the next element in focus was the workforce. The quality and quantity of technology professionals were low in the city. Therefore, to boost the capacity of the workforce, training was provided by various measures. Classes were set up in and around the Ameerpet area to create trained professionals in mainframe systems, Lotus Notes and other relevant courses at the time. Potential candidates were also sent to Trivandrum (Thiruvananthapuram) to train on the IBM mainframe systems.

7.4 The world's view of Hyderabad

Before its world branding as the global IT hub, Hyderabad was a blip on the world's radar. The IT sector in the city required more than usual marketing effort. Representing Hyderabad at the 1990s Comdex, a computer expo trade show in the 90s and early 2000s is when Mr. JAC realised the insignificant existence of Hyderabad on the global map. Questions that he and his team encountered; enquiring whether this Hyderabad was in Pakistan? Other such questions that arose were-were there direct international flights available? Were there international schools available for the children of expats? Answering each of these questions Mr. JAC, at a point, had to pull out a piece of paper to illustrate the location of Hyderabad!

With the then AP government's persistence and persuasion, Mr. JAC's efforts finally ended up in Citibank setting up an office in Hyderabad. Once the word spread about the newly emerged infrastructure to support IT and related activities, smaller foreign companies began to take notice and slowly began to shift to

Hyderabad. The companies were cautious as well. They sent in their teams to survey and assess the city's IT industry. And thus began the inflow of companies into Hyderabad.

The first round of companies that came were BPOs (Business Process Outsourcing). Initially, the quality of human resources for technology product and innovation were not available in the city. The IT services sector, however, became a viable option as the cost of operations was lower along with the requisite human resources. Mr. JAC recalls the tag back in the day the received was BPO city'.

There were a few milestones in the story of Hyderabad's IT journey. Apart from the satellite station set up, it was the Y2K that gave rise to the Indian IT companies. Hyderabad benefitted significantly as it had trained human resources, thanks to the government's initiatives and an emerging training hub in Ameerpet. Along with trained personnel, the cost of recruitment and retention of personnel was comparatively lower, making Hyderabad a favourable destination for IT companies from the global market. The other wave for the industry was ERP (Enterprise Resource Planning); this refers to software that integrates and manages a company's business operations. This, too, is accredited to the coaching and training availability in and around the Ameerpet area. The ERP boom happened in Hyderabad compared to other cities, with companies like SAP labs coming in and many others.

These two milestones created the human resource that seemed to be lacking initially for the IT growth. With the boost in training activities slowly, the critical mass for the IT industry was growing.

With the BPOs and ERP boom, other companies moved to Hyderabad as their IT destination.

Moving forward, the global image that preceded Hyderabad in the 90s needed an overhaul. With the critical mass growing and necessary infrastructure coming into place, the focus was to build global visibility. Indeed, with the BPOs and ERP boom, other companies moved to Hyderabad as their IT destination. The next big move by the state government was to bring in Microsoft in Hyderabad. Mr. JAC recalls after the first survey visit of Microsoft; the company refused to set up in Hyderabad. This refusal made Mr. JAC and his team pursue them via requests to the then CM's office to invite them a second time and convince Mr. Bill Gates to relook into the matter. After another survey by the team and a round of discussion, Microsoft finally set up an office

in Hyderabad. This move gave Hyderabad the global visibility it needed as an upcoming IT destination in the world. Another feather in the then AP governments that says Mr. JAC was the ability to convince US President Clinton to visit Hyderabad instead of Bangalore. President Clinton's visit brought with him all the news channels, the print press, and all the world's eyes with him to Hyderabad. Millions of dollars' worth of marketing say Mr. JAC happened with just that one visit.

7.5 Hyderabad, in comparison to other IT cities

As compared to the other IT cities of the country Hyderabad had an edge in certain aspects. Mr.. JAC credits Hyderabad for its better quality and quantity of workforce capacities over the years, meaning the critical mass compared to Mumbai or Bangalore. The cost of living in these other cities was far higher than Hyderabad, making them less viable for professionals migrating from multiple locations. According to him, another factor that seems to have worked well for Hyderabad is the fact that the people from AP preferred to pursue engineering for graduation. Whether they pursued it locally or moved to the US to study or work, this became a pattern. Having the local Telugu persons as professionals in various IT companies made it easier to convince them to look into Hyderabad as their next destination.

Another factor that seems to have worked well for Hyderabad is the fact that the people from AP preferred to pursue engineering for graduation.

The Telegu NRI's, too, were willing to move back to the state and work in Hyderabad. This move brought experienced quality professionals to Hyderabad. During such time, the R&D aspect of the industry began to develop. Companies like Microsoft coupled with the reverse migration of IT professionals gave an impetus to R&D centres in Hyderabad, which earlier were confined to Chennai or Mumbai.

7.6 Start-up Ecosystem

According to Mr.. JAC, the one aspect which Hyderabad was lacking during the early 2000s was the ecosystem for start-ups. Bangalore had a better environment for start-ups. Mr. JAC as president of TiE (The Indus Entrepreneurs) at the time, collaborated with ISB (Indian School of Business) to conduct a Business-Plan competition for start-up ideas to boost the start-up ecosystem in the city. Most students participated in this competition when other investors were approached; they were not keen as Hyderabad lacked angel investors in the industry. People invested in real estate in Hyderabad but were wary of investing in tech-related innovation. To help the environment, Mr. JAC and a few colleagues from the industry created an angel-Investment

The creation of T-Hub boosted the visibility and credibility of Hyderabad's start-ups.

Forum called Hyderabad Angels. It was meant to support technology-oriented product start-ups with funding in the initial stages of the firm.

The government of Telangana took notice of the need for supplementing these efforts for the start-up ecosystem. The creation of T-Hub boosted the visibility and credibility of Hyderabad's start-ups. Mr. JAC credits Mr. K.T.Ramarao (IT minister TS) and Mr. Jayesh Ranjan (Principal Secretary I&C and IT of T.S.) for conceptualising the start-up incubators which roped in many venture capitalists to set up headquarters in Hyderabad.

7.7 Leader in E-governance

The state of Telangana and AP (united) have been leaders in e-governance initiatives in the country. Incorporating services such as e-Seva back in the 90s, was rare, and it brought about local companies to collaborate with the government to solve the technological glitches. The government initiative played a crucial role in creating a lasting technical environment in the state.

All the above-helped position Hyderabad where it is now.

8. A Serial Entrepreneur, Culture Curator and a Rocket Scientist Speaks

Asshar Farhan is a serial entrepreneur, technologist and an angel investor. He shares his observations and the journey of his growth along with Hyderabad as an IT capital.

- **Delving into the pre-IT/Software industry in the southern Indian cities**

The southern cities in India, like Hyderabad and Bangalore, have always had a geographic advantage - the south-central location in India meant that it was a haven for things that are of strategic interest to the country, says Farhan. Notable examples are ECIL, HAL and defence establishments that were headquartered here, given that these cities had a safe distance from Pakistan and Chinese borders. Several academic universities like the O.U., Andhra University, JNTU, Central University were also founded here. An essential factor that boosted industrial and educational sector growth here was that the land surrounding Hyderabad belonged to Nizam which meant enough land was given away by the government to several establishments and at a later date to the IT industry.

An essential factor that boosted industrial and educational sector growth here was that the land surrounding Hyderabad was given away by the government to several establishments and at a later date to the IT industry

In the late 60s to mid-70s, major investments were made into public sector undertakings in both cities, especially in the

technology and pharmaceutical spaces. Hyderabad's rise as a pharma giant can be traced back to this timeframe, giving rise to firms like the Dr. Reddy's by Anji Reddy. ECIL was the first to manufacture computer hardware and supply it to the PSU's. Large PSU's started outsourcing some of their work to the smaller private sector companies. As a result, a large ancillary sector developed over a while before the software boom. According to Farhan, Kushaiguda was considered to be the original electronic city of Hyderabad (before the present day HITEC city), was located near BHEL and ECIL, rather in between the two. In this area, under small sheds and small spaces, fresh engineers would set up small companies with around 7-8 people making circuit boards, chips, etc. and also developing software on microprocessors because till then there was no concept of a personal computer. Computer ownership on an individual level was not a concept back then; they were owned by the larger entities, the organisations where one worked. Thus, the pre-PC days software development was taking place mainly in Bangalore and Hyderabad owing to the government. Most of these smaller companies that got these contracts for developing software were handed their contracts by the government.

During the 1982 Asian games, along with the small-time software development, there was a budding analogue electronics market. Although the games were happening in Delhi, two main things came out of it - colour TV had just come up and the Indian National Satellite System (INSAT) got commissioned which gave the national television network, the Doordarshan. Two relays and two stations from the satellite to the township were installed, plus two stations every day. Thus, rapidly the TV crowd started to grow, the viewership increased, and the demand for manufacturing these TV units came up. ECIL in Hyderabad developed a design with Indian components to build TV sets and outsourced it to several smaller companies which worked out of Hyderabad. Therefore, Hyderabad developed a manufacturing capacity for electronics and digital electronics with this. Around 30-40% of TVs in India in the 80s and 90s were manufactured in Hyderabad at ECIL.

While the software and the hardware industry in India and particularly in Hyderabad was developing, heavy migration was happening to the USA and the skilled professionals made the move. Hyderabad had one of the first private engineering institutions in the country (Muffakham Jah College of

Engineering). Until then, only the government had a monopoly on the engineering degree. Slowly, he says, Bangalore, Hyderabad and Gulbarga started having private institutions for engineering. Therefore, the access to these courses increased and the number of engineering graduates also started to rise.

Hyderabad also has the single largest migration of skilled labour to other countries like the Middle East, Dubai, and other parts. People from Kerala are a common sight, too many professionals from Hyderabad work there as well. Places around Hyderabad like Guntur, Vijayawada, Vizag, also started adopting the migration trend. The increase in this migration gave rise to the need to learn and equip oneself to do more than what was being taught in engineering. Several training institutes started to come up in Hyderabad - some low tech and some high tech like National Institute of Information Technology (NIIT) and APTECH, etc. These developments were all enabled by the advent of personal computers (PC) which gave the go-ahead for the industry and developers to come up with a unified software, and therefore, small programming shops also started popping up. These small programming shops became the ancillary industry for the manufacturing unit. For instance, WIPRO was a computer manufacturer that also had its software.

Small programming shops became the ancillary industry for the manufacturing unit

Farhan worked with a company called Integrated Data Systems which wrote banking software for PC's. Most of these services were focused on serving the Indian customers, and the Indian base needs. While working, he realised that most of the computing was happening in English, which pushed him to see a business opportunity which was to develop typesetting for an Indian language and specifically for Urdu. He started to develop and deploy Urdu typesetting systems across all newspapers. The batches of graduates from the 70s and the 80s essentially were small groups of youngsters trying to figure out problem areas in the society and plug them in with the computing solutions.

Several more prominent companies would get contracts for projects which they had no equipment or knowledge. These bigger companies then approached smaller enterprises to get the job done. One example is BHEL. They wanted an attendance recording system with card-swiping technology. International Computers Indian Manufacture (ICIM) was India's largest computer company, but they did not understand card readers and systems. One of Farhan's friends developed a card reading software and sold it to ICIM. Most of the development of

software and the audience it catered to was Indian, which by no means was easy. With the bureaucracy and red-tapism, it takes no time for one to learn that there is favouritism. An example of this was the Andhra Pradesh Technology Services (APTS); it was impossible to get oneself (company) empanelled or get work through this system. Due to these hurdles and complications, smaller companies decided to sell their software systems to the smaller buyer in the private sector but not to the government.

With satellites like Indian National Satellite System (INSAT) and a few others coming up, there were earth stations set up, which increased the connectivity. It was still the pre-internet era, but data was coming into India; although it was available, it was expensive. During this phase is when the STPI's was set up. In Hyderabad, it was at the Maitrivanam building in Ameerpet where the first satellite downlink was established. The downlink could then be streamed to people who had taken office at Maitrivanam. The building in Ameerpet became the first incubator, where entrepreneurs would take up a one-room office and the rest of the office and staff elsewhere just so that the uploads and downloads could be done quickly. The internet was cheap and reliable and it first came to Hyderabad through Jagdish, a friend of Farhan's. He had taken dial-up accounts in the US for internet connection. A long-distance call to a landline in the US to a modem in the US would access the internet. The catch was the cost - it was expensive as each minute was priced around ₹ 36! Several enterprising people at that time took to this occasion, one being Ms. Mateen Ansari. She was the first to establish the first internet service in the city. Along with the rise of connectivity and the internet, one forgotten element was the BBS- Bulletin board services. The BBS was not an internet system, but the process was that a person who had a computer and a modem which is connected to a phone line would keep it switched on so that somebody else in the city could dial in from their computer to the one with the modem which could then download or upload files or leave messages on it. BBS was thus similar to a fax machine. This BBS system and service helped many people to get connected.

The professionals who moved abroad to work started to move up the corporate ladders in their respective companies. With that came the realisation of the opportunity to bring some of their work back to India, where the industry was starting to take off. Senior software professionals such as Srini Raju were coming

back from their high positions in the US to set up shop here in India. People like Mr. JAC were enabling and knitting the whole software industry ecosystem here in Hyderabad. There was a coming together of sorts happening, and the timing was great. The first generation of software companies was catering to the Indian audience - clustered in Secunderabad, from the Paradise junction to the Begumpet airport stretch, companies like HP, Intergraph, DE Shaw, OMC, CMC etc. came up. OMC computers were one of the first companies to use UNIX (now LINUX, operating system shell) to write software for banks and more. The software developers and coders became quite proficient working at OMC. Soon, their expertise made them heads of various top companies in the coming years. CMC was one such other company that provided the early mentorship for many professionals in the software industry.

Many of these companies had the confidence to set up and build themselves up during the early 90s because of the availability of engineering graduates in the state. Several engineering colleges in and around Hyderabad were set up in quantity and produced good quality engineering graduates. Hyderabad has quite a few good engineering colleges such as Matrusri, Chaitanya Bharathi Institute of Technology (CBIT), Muffakham Jah College of Engineering and Technology (MJCET). Along with these colleges were the training institutes by APTEC Limited and NIIT had come up with good training courses. Therefore, with STPI giving out connections and the educational institutions having access through ERNET, it became easier to get good quality personnel in Hyderabad to work in the software space and the rising data connectivity.

Many of these companies had the confidence to set up and build themselves up during the early 90s because of the availability of engineering graduates in the state.

Alongside Satyam computers was also trying to raise 50 lakh rupees from the US. The change had started to become evident. For example, for the company Intergraph many people in hushed tones discussed that this company does something related to computer-aided design, but it is not known what exactly they do in the building yet the people are paid 1 lakh of rupees per month which came as a shocker - to be paid a lakh a month in the 90s was a bigger deal than we can imagine now. Several other companies like DE Shaw, Automatic Data Processing (ADP) started to explode on Hyderabad's software industry scene. However, of course, the biggest was Satyam. Satyam was hiring personnel in hundreds and thousands back in the day, and very soon, they started running out of people/ graduates to hire.

Ex-pats were moving to Hyderabad. It was imperative to improve the quality of the city's technical infrastructure

The slowdown in the supply of engineering graduates began to see the rise in training institutes like the Ameerpet Training Institutes. Courses were designed for particular tasks and expertise-for example, the Y2K bug. To fix the Y2K bug, one did not need to know the whole COBOL programming language, but only a particular specific part of making the corrections. Most of it was low tech work, but slowly, the market saw demand for advanced work courses.

Ex-pats were moving to Hyderabad. It was imperative to improve the quality of the city's technical infrastructure, i.e., better internet, continuous flow of power and access to power, to attract and retain the NRIs and expats. HITEC city offered good connectivity and the overall betterment of the quality of life.

During the late 70s and 80s, around the time N.T. Ramarao was deposed temporarily, there were massive riots and many were killed and then again during the Mandal agitation. Hyderabad was a city in the grip of strife, but it went away around the time IT as an industry started booming in Hyderabad. The rise of the IT Industry saw a reduction in communal riots in Hyderabad and Hyderabad thus became a peaceful city. Farhan points out this transition of Hyderabad from a less violent to a more peaceful city, not being too sure whether there was a causal link or a mere observation of the events. The transition of a less violent and more peaceful city, Hyderabad, started attracting not only Indian but also foreign investments. The visit from the Bill's led to the setting up of institutions like IIIT and ISB. All of this was part of the infrastructure development happening in the city. While building the HITEC city, Farhan mentions that it was just the cyber tower then. But the HITEC city promised ample connectivity to companies, duty-free import of equipment. It almost seemed like this portion of Hyderabad was not part of the rest of the country - support, infrastructure, and work efficiency were utterly different from anywhere else. At the same time, there was a negative attraction towards the IT sector, particularly by monied people. Soon the rumour mill began. IT exports were not like goods exports, which would not be seen on the books per se, and some people and companies went down this path to launder money, assuming it to be an easier route. The size of the companies started to grow, and the second level of capabilities started to increase, which was to handle more extensive projects. Subway (an American multinational fast food restaurant) started with three people and went on to grow to a 150 member organisation; it hired managers from WIPRO and as a partner.

A lot of senior-level managers and expats started coming back and set up their own companies or rose to head organisations in India. First-generation entrepreneurs started helping other companies, which gave rise to second-generation companies and multiplied the entrepreneurship in Hyderabad. Soon MNCs started to come in. Microsoft, Google had many Hyderabadi's working in these companies, making it easier to choose the city as their location of choice. Moreover, the government in Hyderabad also aggressively chased these companies to set up their operations in the city which no other CM or bureaucrat did earlier and considered it below their dignity to do so. "CM and the government would chase these companies and go door-to-door in contrast with earlier 'license raj' where they would sit on a throne and expect everyone to pay the court before greeting them, acknowledging them, make them wait for hours together." The critical point of it all was the timing. Hyderabad was ripe at this point with the workforce, infrastructure availability, and public sector investments sunk into the city's blood a couple of decades ago.

The land availability, which was specific to Hyderabad, made it possible for the software ndustry to flourish. Even earlier, the land availability had allowed the PSU's such as ECIL, BHEL, HAL, and others to set up and make the industry base in Hyderabad. Hyderabad has had a pre-independence history of supporting industrial growth. The STPI initiative and then going back a few decades to an area called Sanathnagar – Sanath, which means industry. It was probably India's first industrial town, where people were invited to set up their industries and were provided land and power. In the 19th century, in Bholakpur, an industrial area, the Wazir sultan had given land for setting up tobacco industries in the state. Hyderabad thus held the ability to develop infrastructure and institution building as a tradition for almost two centuries. Hyderabad never became an industrial hub such as Maharashtra, but it always invited companies and entrepreneurs and provided them with the best possible resources for growth.

8.1 What happened in Bangalore which did not happen in Hyderabad?

Bangalore had a headstart in technology compared to Hyderabad. The public sector was giving out contracts for software development and related works to the smaller companies. He says that there are far more space-related start-ups because The Indian

Space Research Organisation (ISRO) is based in Bangalore. The employees of these PSUs were usually the ones to break away to start their firms. PSUs allowed greater autonomy in working and projects, unlike what is projected outside.

9. An IT veteran Speaks – Srini Raju

In the beginning, the first computer companies in India were started by illustrious entrepreneurs such as Mr Mohan Reddy; these companies focused on manufacturing rather than providing services. The mantra then for any IT business was to imitate' Computer Management Corporation Private Limited' CMC (now TCS). Every computer science graduate in 1983 in the country wanted to establish a career working for CMC. Interestingly, the first CMC headquarter was established in Hyderabad, and this led to the introduction of many Computer Science programs in Universities of Hyderabad and flourishing of the discipline in the city.

In 1988, one of the first IT service companies was established in Hyderabad. It was a small company and continued to be so until Srini Raju joined it in 1992. It is important to emphasise that the computer industry then was very new, and its future was very uncertain. Everyone knew that it had great potential, but no one knew whether or not it would fulfill its potential.

During that time IntelGraph, one of the biggest MNCs at that time, also set up a center in Hyderabad. The office building, due to its professional quality and American style, became something of a tourist place, with local residents visiting it to get a glimpse of America. The office also became something of an ideal model for young IT entrepreneurs, who dreamt of one day owning an office like it.

It was also during this time that the State Government took an interest in the upcoming IT businesses. The government inquired on what exactly the IT sector faced problems in, and how it can help to increase business activity in the state. The answer they got was that the limiting factor in the growth of the IT sector was mainly infrastructure. Due to this, communication was being undermined and growth was stagnating. Another main problem was with foreign trade. The trade regulation made it very difficult for firms to properly import/export the required hardware they needed and hence were lagging behind on investment.

The government decided to step in and provide solutions to both of these problems. First, they invested heavily on infrastructure

and set up a center in Banjara Hills providing relatively high quality speed for foreign communications, the firms developed the software locally and sent it via the center. Second, they made an STPI clause which eased the importing/exporting restrictions on IT companies.

The then Chief Minister took a trip to the US. Over there, he saw a great deal of very good Indians working, this fact made him rather curious. Why were so many good Indians migrating thousands of miles from their homes and working here? What makes these Indians come here, and what he as a Chief Minister could do to make them stay in India? The most important question he asked was, suppose these Indians came back and started businesses in India, what could be do that would ease the transition?

To answer the question of how to successfully build a start-up ecosystem in India, Srini Raju, now a successful business owner, was called upon. The first answer given was the need for good technical universities in Hyderabad, in lieu of which, the first IIIT was setup in Hyderabad. Following this many Engineering colleges were setup in Hyderabad. The then CM proactively took one step further and started talking with Bill Gates to try and bring Microsoft itself to Hyderabad. Parallel to building universities, infrastructure building was also done. Hyderabad's financial district was constructed to attract businesses to Hyderabad.

Emphasis has to be on cluster development. Each cluster must include office spaces, housing for all categories including lower income group, land to set up schools & hospitals on land lease basis.

Soon after, American companies started taking a keen interest in Hyderabad. Microsoft moved in, and soon after many of its American contemporaries joined it. The growth of the city was now starting to take place. The growth did not take place uninterrupted though. From 2002 to 2004, there was a massive slowdown in growth. A partial, albeit important, reason for this was the American dotcom bubble crash in the late 90's, which belatedly affected Hyderabad as most of the companies were from America. However, soon after 2004, things started picking up and it was boom years again.

However despite the state's impressive growth trajectory and its success, there are a few weak areas in which the state was seriously held back. One of the major areas is infrastructure. Though there have been significant improvements in the city's infrastructure, they have not been enough. Electricity transmission is still via overhead wires which are neither safe nor efficient. There are no solar panels in the city and the sewage and drainage systems are also deficient. The state should take an initiative to fix these issues once and for all.

Emphasis has to be on cluster development, he says. Each cluster must include office spaces, housing for all categories including lower income group, land to set up schools & hospitals on land lease basis. There should be schools & hospitals for all categories of people. This will address the perennial traffic problems and improve productivity.

Another major problem is transportation. Although setting up a metro is a very welcome move, it is not enough. There is an uneven development of living and working places that make it difficult for people to move about. Not to mention the traffic issues commuting everyday causes. The state should plan its cities effectively, making sure that working areas are not incredibly far from living areas and the living areas are well stocked with hospitals, schools, and the place necessary for day-to-day survival. It should try and aim to build a city such that the offices and homes are at least walking distance from each other, this prevents the wastage of time as well as environmental pollution.

SECTION – 2

HYDERABAD'S INTERNATIONAL TRADE-IN INFORMATION TECHNOLOGY

1. Introduction

The information technology (IT) sector is well defined, with international IT goods and services classifications. Trade in the IT sector has increased by leaps and bounds over the years and provides critical information and analysis of the information economy. International trade in information technology is significant to any country's development for reasons such as the following:

1) It leads to value creation,

2) Creates employment opportunities,

3) Generates foreign exchange

This section attempts to document the history of international trade in information technology goods and services and Hyderabad's position in the global scenario by combining data from myriad sources, including the World Bank, United Nations Conference on Trade and Development (UNCTAD), Reserve Bank of India (RBI), and other official data and reports from various government departments in India.

2. An overview of International Trade in Information Technology

Information technology is an integral part of our lives today. The information revolution has changed the world. Literature reviews provide necessary insight on how information technology was adopted around the world. It further helps us analyse the policies adopted by governments, comparative advantages of countries and success models of various geographies. However, one must note that public policy' best practices' have largely converged today, and IT has become an irreplaceable part of business and public institutions everywhere.

Much of the cross-country analysis and literature review focuses on the correlation between capital stock and accumulation and the adoption and growth of information technology in various parts of

the world. Physical capital is a critical factor in both developed and developing countries. Investment in IT infrastructure is crucial to effectively adapt, enhance and amplify the effects of information technology. Developed countries had built a mature stock of physical infrastructure during early stages of the information technology revolution, unlike developing countries. The lack of physical stock or infrastructure made it difficult for developing countries to benefit from advances in technology. The challenge to deploy information technology in their social and economic institutions was extreme tedious. The diffusion of new technology was slow, hence, contributed to the failure of developing countries in integrating information technology into their working systems (Pohjola, 2000).

Europe

The European story of information technology captures the effect of capital accumulation on the growth of information technology. The first group of countries like the U.K. and the Netherlands invested a large number of resources in developing new technology, The return to growth in Finland, the continuation of the economic boom in Ireland and the strengthening of the favourable upswing in Denmark throughout the late 1990s can also be associated with a sharply increasing contribution of new technologies in growth.

The second group of countries that invested less in the capital have witnessed a limited growth of newer technology, like in Italy and Spain.

The third group in Europe is one where resources were continuously channelled into the development of information technology. Sweden, France, Germany and Belgium are examples of this. The adoption of information technology as a result of capital accumulation in ICT came about as a result of high GDP growth rates (Daveri, 2000).

Asia

On the Asian side, a varied development of ICT can be seen across the spectrum. Moreover different countries specialise in different aspects of ICT. Thailand, for instance, has adopted policies that boosted its hardware and manufacturing industry. It is now a major global manufacturer and exporter of several electronics products/components. Trade has played a key role in building up this industry by facilitating capital and technology inflows and providing access to international markets, realising that its

domestic market was rather small to support industrialisation, Thailand shifted from an "import-substitution" to an "export oriented" development strategy. (UNCTAD/ITE/IPC, 2005) This required liberalisation of the economy for trade and investments.

The growth of India's software industry followed similar lines. Another similarity that many developing countries share is the significance of transnational cooperation's (TNCs) role in giving an impetus to the development and growth of information technology. TNCs have played a significant role in transferring technologies by setting up facilities to assemble and manufacture electronics products in Thailand, Korea, and many parts of Africa. Given its huge market potential and low-cost labour, China has negotiated with foreign firms for technology transfer and attracts large foreign investment. Today, it has made major strides in becoming a producer of computer hardware. China has become a significant export platform for many components and peripherals, such as motherboards, keyboards, add-on cards, scanners and printers. Many of these are produced by Taiwanese companies. China's government also continues its efforts to develop a strong domestic technology base. One way is through investment in R&D, which has grown rapidly. Another is by requiring foreign firms to transfer technology to China in return for market access.

Japan is another success story in Asia. China's initial success in producing and exporting light manufactured goods and services has earned it the reputation of being a desirable location for all manufacturing. Conversely, years ago, Japanese automakers had to fight the reputation for their shoddy quality that its early exports of light manufacturers had earned (Kraemer, 2001).

Today, India enjoys a reputation for service quality primarily because of its software industry. It helped in making India a destination for other service exports. Even being one of the foremost countries in information technology, the Japanese government has faced similar problems to those that many of us face now, particularly in helping small businesses.

A variety of reasons exist for small firms not taking off; these include:

1) The high cost of laying off workers that are no longer needed as a result of the introduction of ICT,

2) The high cost of ICT inputs in comparison with the United States,

3) The tendency of firms to regard ICT just as a cost-saving option and not as a path to innovation inbusiness models,

(4) The tendency of firms to choose custom software rather than packaged software in order to avoid changes in corporate structure and employment adjustment

(5) The reduction of investment in intangibles by firms (Kyoji, 2015).

However, building a local support industry and innovative domestic capacities have been crucial to every country worldwide. Let us take a look at India, Israel and Ireland. During the 1990s, these three emerged as significant software exporters. Many MNCs entered Ireland before the formation of an Irish domestic industry, and their activities have remained mainly focused on low value-added activities. By contrast, in India and Israel, the bulk of MNCs have entered after the emergence of a domestic industry. Their activities, however, are different. In India, with few exceptions, MNCs mainly carry out off-shore outsourcing services, while in Israel, most MNCs conduct higher value-added activities (including R&D). In the case of Ireland, MNCs have helped start the growth process by providing the domestic industry with market access spill overs and productivity spill overs in the form of people mobility. MNCs have provided significant complementary resources in Israel and India, like finance, marketing and managerial capabilities, to domestic firms, but after a regional software cluster has developed independently from the MNCs. MNCs may have produced some negative externalities in the labour market, but this is not the product market where most domestic firms do not directly compete with MNCs. On some occasions, MNCs' acquisition of minority stakes in domestic firms has increased firms' overall reputation and, therefore, has eased their access to foreign markets (Giarratana, 2003).

There is a need for studying the practices, policies and events that resulted in the adoption and development of information technology around the world. The comparative advantage of a country can foster development and benefit both parties. Transfer of technology, promotion of outsourcing software, development of computer producers in regions with good quality cheap labour can exploit the market.

3. The development of International Trade in Information Technology

In 1947, Bell Labs made the first-ever semiconductor transistor. It is acknowledged by many as the beginning of the contemporary information economy. The transistors were an essential component in the invention of mainframe computers, whose commercialisation began in the 1950s and spread to most parts of the world by the 1980s. Next came Jack Kilby's integrated circuit in 1958 and later by Robert Noyce in 1959. Integrated circuits gave rise to microprocessors and logic chips. In 1968, Gordon Moore and Robert Noyce founded Intel Corporation to speed up the commercialisation of microchips. The invention of personal computers (PC) by IBM followed this, and finally, internet began in the 1990s leading to the information revolution.

3.1 Table 1 shows the period for broad adoption and deployment of various technology artefacts (hardware and software)

Information Technology Artifacts	Time Period
Mainframe Computers	1940s-1950s
Transistors	1940s-1950s
Programming Languages	1950s-1960s
Integrated Circuits and Microchips	1960s
Online Systems	1960s
Minicomputers	1960s-1970s
Bank ATMs	1960s-1970s
Intel Microprocessor	1970s
Personal Computers	1970s
Compact Discs	1980s
Video games	1980s
Microsoft Windows	1980s
World Wide Web	1990s
Cell Phones	1990s
DVD's	1990s
MP3s/Phones/Tablets	2000

Various factors contributed to the proliferation and diffusion of information technology worldwide. The cold war period was important for innovation, exposure, and deployment of technology, especially in countries such as the former USSR, Great Britain, France, Australia, and the US between the 1940s to 1950s. Apart from defence-related technology, consumer electronics, including cell phones, spread rapidly across Western Europe into Japan and South Korea. International cooperation also played a significant role in spreading technology and influencing various governments and national policies to allow free trade in technology worldwide.

Vendors such as IBM, Phillips, Exxon, and Toyota exported their technologies and contributed to technology transfer in many developing countries. IBM was a particularly crucial vendor that introduced large mainframe systems to many governments, universities and private corporations(Cortada, 2012).

Lastly, international institutions such as the World Bank, United Nations and World Trade Organization (WTO) significantly contributed to the vision of liberal and free trade in information technology. The World Bank, through information technology, aimed to raise the standard of living in many developing countries, as seen in their work in Latin America, Asian and African nations, particularly in the 1970s. The Information Technology Agreement (ITA) of the WTO was another milestone that worked against free trade barriers in the IT Industry. The ITA was signed in 1996 and went into effect in 1997. The main objective of the ITA agreement is to eliminate duties and non-tariff barriers and promote greater market access, reduce transaction costs and enhance export revenues. Initially, 29 participants had signed the deal in 1996. Since then, the number of participants has grown to 82, representing about 97 per cent of world trade in IT products.

The IT Industry has been crucial to the growth of many economies, for instance -Great Britain in 1950s- 1960s, France in 1960s- 1970s, Japan and Korea in 1970s- 1980s and India in the 1990s – 2000s saw a surge in development with the success of their IT Industry.

The data available in the World Bank Database is widely considered the most consistent and reliable database. The database has a record for trade-in IT service exports from the 1960s. It reveals that the IT services trade started in 1960 with Israel taking the lead, followed by the US, Sweden and North

America in 1970, Chile in 1975, Cyprus, Korea and Sweden in 1976, and Switzerland and Algeria in 1977. These were some early starters in the field of exports in information technology services.

However, it must be pointed out that it is widely acknowledged that there is a shortage of data to recreate the accurate history of the software industry between the 1950s-1980s. In the contemporary economy, studying the trade-in IT service exports has become extremely important because for many countries IT service exports form a considerable chunk of the revenue they receive from their IT industries. The top 5 exporters of IT services in 2017 were Ireland, India, Finland, Israel and Sweden. Among them, the top 4, for instance, Ireland, India, Finland and Israel, have more than 25 per cent of their total exports as IT service exports.

3.2 Top 10 IT Service Exporters 2017, UNCTAD

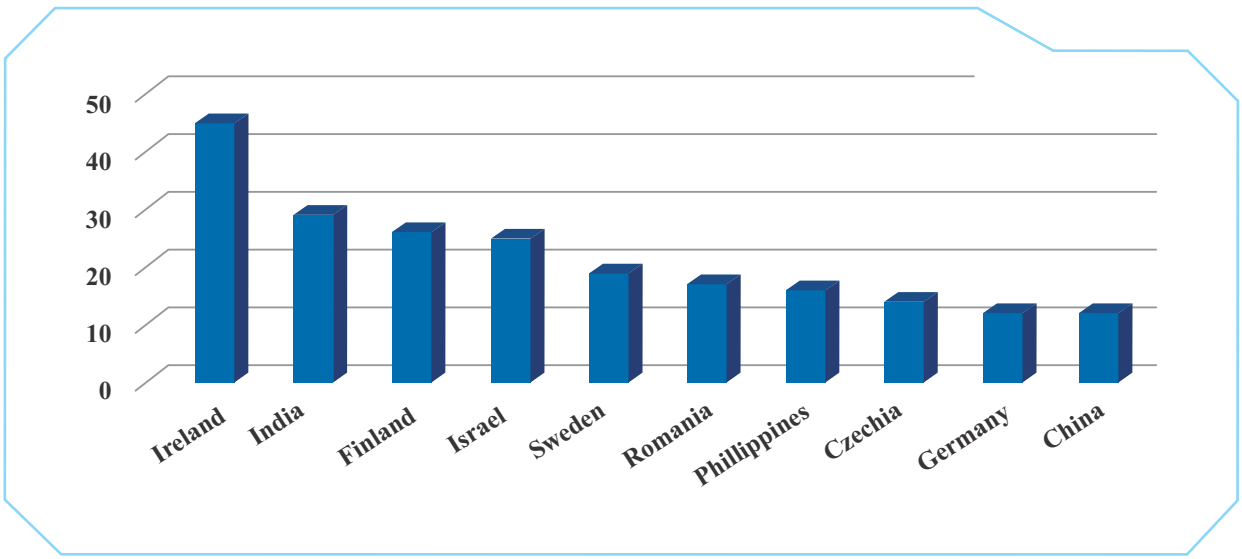


Figure 1: Top 10 IT Service Exporters 2017, UNCTAD

Data from UNCTAD also reveals that the Top 10 exporters In Information and technology goods accounted for 99.6% of the total value of IT goods exports in 2017. In the trade of IT goods, China ranked as the largest exporter, contributing 38% of all IT goods exports. Meanwhile, the Republic of Korea has shown the highest annual growth rate due to its unprecedented growth in the Internet of Things (IoT) since 2015. According to figures released by UNCTAD, the demand for electronic components used in IoT drove the trade-in international imports of information and communications technology goods in 2017 to

Top 10 exporters In Information and technology goods accounted for 99.6% of the total value of ITgoods exports in 2017.

reach $201 trillion. Meanwhile, the United States has not seen any significant growth in exports, but they remain the top importer of IT goods. The US is followed closely by China and Hong Kong regarding the highest imports in IT goods. India has not made its place among the top countries dealing with information and technology goods trade.

4. The Case of Hyderabad and India: Development of International Trade in IT

Jawaharlal Nehru had a vision for India. He wanted to sow the seeds for the development of science and technology in independent India. He presented the Scientific Policy Resolution in the Lok Sabha on 13th March 1958. He believed that, "Early and large-scale development of science and technology in the country could greatly reduce the drain on capital during the early and critical stages of industrialisation."

Still, it took until 1963 for India to set up its Electronics Committee, also known popularly as the Bhabha Committee. The Bhabha Committee was an important milestone - it laid out a blueprint for developing the indigenous electronics industry based on research and development, design, training and select foreign inputs. s. The report also made a strong case for the development of the electronics industry. It highlighted that the industry could create up to 4 lakh jobs. All recommendations were accepted and in 1970, a National Conference on Electronics was organised to review the status of the electronics industry. The Conference made a series of recommendations.

There was a growing realisation that self-reliance in electronics and computers from design to development was unrealistic and was slowing down the development of technology in India

Soon enough, there was a growing realisation that self-reliance in electronics and computers-from design to development was unrealistic and was slowing down the development of technology in India. It was hence believed that a liberal policy that would open doors for foreign collaborations in R&D and permit the import of technology to restricted organisations having strong R&D groups. The conference led to the Department of Electronics (DoE) and the Electronics Commission (EC). The broad agenda of EC and DoE was to make India self-reliant in electronics, including computer technology. In their first annual report, the EC set the agenda for self-reliance in computers and allowed foreign investment for 100% export-oriented ventures. Computers, other than those made locally, were regarded as expensive imports. The political climate believed that automation would lead to the loss of jobs. Thus, importing a computer would

mean that one must go through a rigorous and exhausting system to obtain clearance.

Between 1966 to 1977 the restrictions on the import of computers and software grew, , thus stifling the private sector. While India rejected applications from major American companies to set up manufacturing units, Hong Kong, Taiwan, Singapore, Malaysia were formulating aggressive policies to facilitate foreign investment in advanced technology manufacturing. The emphasis was on regulation rather than on development. By the time the DoE was ready to let Indians have minicomputers, the world had moved to microcomputers.

Table 1: India's software exports, 1980 -1995, Heeks, UNCTAD

Year	Net Exports ($ Millions)
1980	1.4
1981	2.4
1982	4.7
1983	6.4
1984	8.9
1985	9.7
1986	13.6
1987	18.9
1988	24.4
1989	36.9
1990	45.9
1991	60.9
1992	76.9
1993	109.9
1994	168.3

In 1979, the Sondhi Panel proposed a rational framework for India's information and technology sector. The framework enabled the birth of the Indian software Industry and helped many small software firms to take up export roles. For speedy approvals of manufacturing and imports, the Electronic Approval Body (EBA) was suggested to act as a single-window clearance authority for electronics. Restrictions on the import of computers and software continued priority to public sector companies such as ECIL, thus stifling the private sector. A new policy on electronics was announced in 1980 that stated that the government would freely allow technology import. In 1982, DoE had begun work on a new computer policy. The fundamental objective of the policy was to 'simplify existing procedures to enable users to obtain computers of their requirements from indigenous sources or overseas sources, mainly regulated through fiscal measures. The policy also recognised software development as an 'industry'.

Within a year of the new computer policy, computer production grew by 100 per cent in unit terms and 65 per cent in monetary terms, while prices fell by 50 per cent. India's software exports were estimated at $30 million in 1985, with CMC, TCS, and TBL major contributors. The DoE came up with a policy on computer software exports development and training that aimed to promote software exports and capture a sizable share in the international software market.

The liberalisation had a mixed impact. Several thousand P.C.s came into the country and gave rise to software companies that catered to the software needs of computer owners. However, the flood of foreign collaborations meant the end of R&D in Indian companies and local firms were forced to opt for foreign cooperation in joint ventures or reselling arrangements with multinationals (Sharma D. C., The Long Revolution - The Birth and Growth of Indias Economy, 2009).

India

Figures 3 and 4 depict India's exports in IT goods and services since the year 2000.

- **IT goods imports (% of total goods imports)**

Definition: Information and communication technology goods imports include computers and peripheral equipment, communication equipment, consumer electronic equipment, electronic components, and other information and technology goods (miscellaneous)

- **IT services exports (% of service exports, BoP)**

Definition: Information and communication technology service exports include computer and communications services (telecommunications and postal and courier services) and information services (computer data and news-related service transactions)

4.1 Indian Exports of ICT Goods

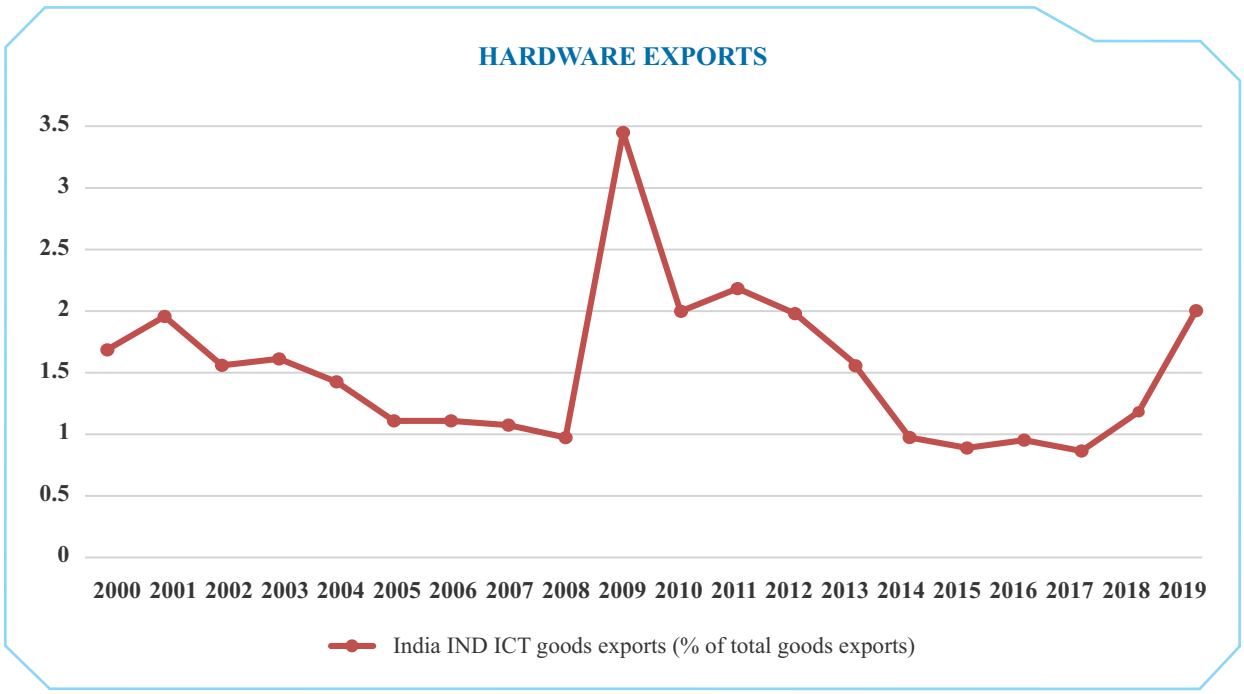


Figure 3: Exports of IT Goods (India), World Bank

4.2 India's service exports

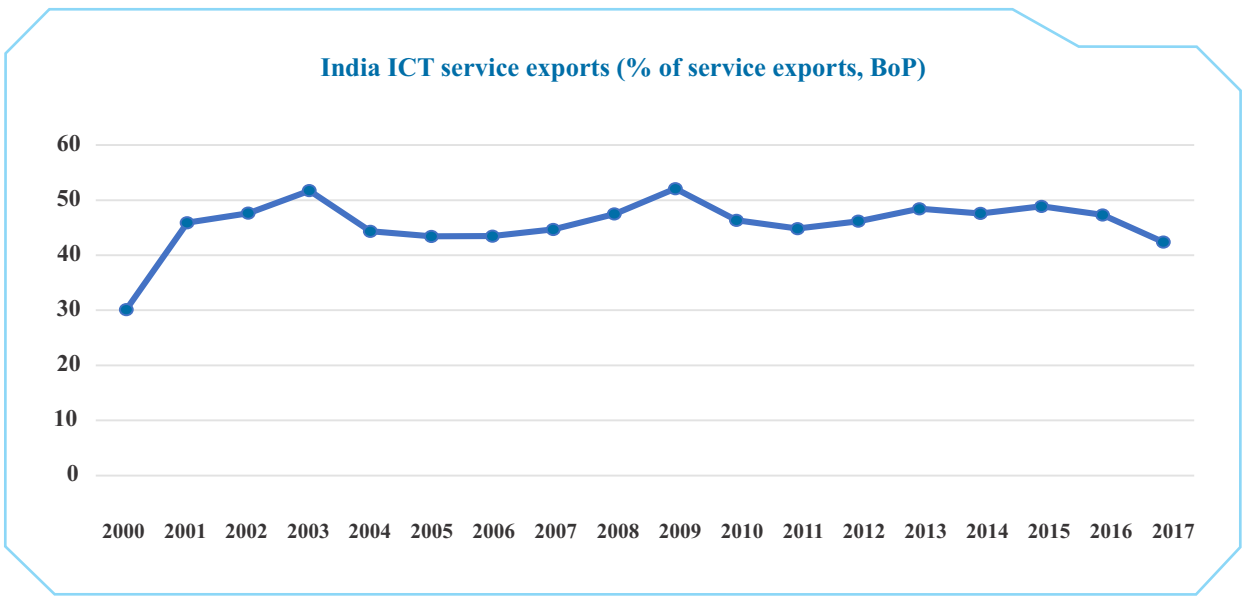


Figure 4: India's service exports (% of all service exports, BoP), World Bank

Hardware exports in India registered a decline of nearly 16 per cent during the fiscal year 2004-2005 but slowly began to rise over the year 2007-2008, where there was a rapid increase of exports in electronics hardware.

In 2016, 57 per cent of India's total exports of services were digitally delivered. Computer services were the most significant contributor, representing two-thirds of the total amount (UNCTAD, 2019). IT service exports have consistently bagged nearly 50 per cent of total service exports in India. USA and Canada have had the largest share of IT service imports from India over the years, followed by Europe, Asia, Australia and New Zealand. However, as we can see, IT service exports have been declining over the past few years.

The latest RBI Survey (2019-2020) provides us with significant insights into the IT sector. The highlights of the survey are as follows:

1. Software and ITES/BPO services exports: India's exports of software services and ITES/BPO services during the year 2019-20 is estimated to be 911,702 billion. Exports of computer services and ITES/BPO services accounted 66.6 per cent and 33.4 per cent, respectively.
2. Industry-wise distribution of BPO service exports: Among major activities in BPO service exports, the share of business consulting services, including public relations services, increased during the year.
3. Country-wise share: the USA was the foremost destination for software exports with 55.6 per cent. Europe had 27.6 per cent, nearly half of which is to the U.K.
4. Organisation-wise share: Private limited companies accounted for more than half of the total export of software services.
5. Software Exports by Foreign Affiliates of Indian Companies: The software exports by foreign affiliates to significant destinations (US and UK) stood at US. $ 16.6 billion in 2019-20 and total exports of software services by India, including the services delivered by foreign affiliates, are estimated at the US. $ 145.2 billion.

In 2019-2020, total revenue from IT (incl. hardware) was up by 7.7 per cent. Digital revenue share was between 26-28 per cent. IT services grew at a rate of 6.7 per cent, of which modernisation of the core services is led by automation. Business Process

Management (BPM) software grew at 8 per cent. R&D has the fastest-growing segment at 11 per cent, driven by an increased focus on digital engineering. Finally, in the Financial Year 2020, Software Products and Start-ups grew at 9.5 per cent, driven by product development around A.I., RPA, cloud and analytics. Business to Business (B2B) product-based start-ups have seen a strong performance.

In 2019-2020, total revenue from IT (incl. hardware) was up by 7.7 per cent

E-commerce is growing at ~25% in FY2020, driven by increasing penetration of m-commerce (mobile commerce). There is a growing demand for niche products and easy and secure digital payment channels. Social commerce has gained traction.

Among the list of reasons that India's IT Industry took-off, foreign direct investments (FDI) are a critical component. FDI inflows come through foreign affiliates, cross-border mergers and acquisitions (M&A), exports transnational companies (TNCs) and R&D projects. The key sectors that attract maximum FDI inflows in India include the service segment, computer software and hardware, telecommunications, construction development, automobile, chemicals and pharmaceuticals.

Figure 6 and Table 3 below indicate the country-wise distribution of India's software service and India's total FDI equity inflow in the computer and hardware sector, respectively.

Between January 2000 and September 2019, FDI Inflows in the computer software industry of India have soared, while the hardware sector is still struggling to attract FDI.

Table 3: Total FDI equity inflows in Computer (Hardware and Software) sector 2000-2019, DPIIT

Sub Sectors	FDI equity Inflows (Rs. crores)	% with total FDI Inflows
Computer Software Industry	261,985.95	9.37
Computer Hardware	3,158.59	0.11
Others (Software)	1,345.62	0.05
Total of above	**266,490.16**	**9.53**

Source: DPIIT

Between January 2000 and September 2019, FDI Inflows in the computer software industry of India have soared, while the hardware sector is still struggling to attract FDI

As seen, nearly 99 per cent of the FDI equity inflows in India goes to India's computer software sector, with very minimal investment in the hardware sector. Mauritius ranked first in the share of top five countries, attracting FDI equity inflows into India's computer and hardware sector, sending across 29% of FDI. It was followed by Singapore (26%), the USA (13%), the Netherlands (10%) and the Cayman Islands (5%). Further, FDI data for the same period (2000-2019) shows the share of states in India that attracted the highest amount of FDI equity inflows.

Table 4: State Wise Distribution of FDI Equity Inflows in Computer Hardware and Software, 2000-2019

RBI's Regional Office	States Covered	Amount of FDI Equity Inflows (Rs. crore)	% with Total FDI inflows
Bangalore	Karnataka	66565.19	25.18
New Delhi	Delhi, Part of UP and Haryana	60025.27	23.14
Mumbai	Maharashtra, Daman and Diu Dadra Nagar Haveli	56008.19	22.30
Chennai	Tamil Nadu, Pondicherry	11279.15	5.02
Hyderabad	Andhra Pradesh and Telangana	10977.08	4.25
	Total	**204,854.88**	**79.89**

Source: DPIIT

As seen from above, Bangalore has received the highest share of FDI equity inflows between 2000-2019, followed by New Delhi, Mumbai, Chennai and Hyderabad. Hyderabad ranks 5th In India with a total share of 4.45% of the total percentage of FDI equity inflows in the computer and hardware sector. There is a difference of nearly 50,000 crores between Bangalore and Hyderabad in total FDI equity inflow received in the past 19 years.

4.2.1 Hyderabad

Telangana was formed in the year 2014. Hyderabad, the capital of the State, has been a hub and a destination for IT since the 1990s. It developed a labour market and invested in capacity building. The story of Hyderabad, the capital city of the former United Andhra Pradesh and the current capital city of Telangana, stands out from that one any other state in India because its government has always been heavily involved in making deliberate decisions and

adopting proactive policies that would transform Hyderabad into a future global hub and the IT capital of India.

Today, not only does Hyderabad attract huge FDI in the realm of information technology, but it has also become the top destination for foreign companies to set up their firms. It further has a robust ecosystem to promote and develop start-ups that attracts the attention of the employment-seeking youth. Moreover, Hyderabad is the home to renowned universities such as IIT Hyderabad and the Indian School of Business (ISB).

In 1999, with the support of Mckinsey consultancy, the Andhra Pradesh government came up with 'The Andhra Pradesh Vision 2020' document. The focus of the strategic document was to develop the state by attracting foreign direct investments and developing specific growth engines to leapfrog toward the information society. Maitrivanam witnessed the development of the first IT incubator in Hyderabad. Only seven IT firms were present in 1990. Soon cyber towers were inaugurated, and many multinational firms started operating from Hyderabad as their headquarters. Hyderabad soon became the 'software training capital' of India. The software exports in 1998-99 were 574 crores which rose to 2855 crores by 2001-02. The growth of software exports has exponential.

In 2019-2020, Hyderabad recorded a whopping 64525 crores worth of software exports. Software imports, on the other hand, were a minuscule 1581.30 crores. Most Fortune 500 companies like Infosys, Microsoft, TCS, Capgemini, Google, and Amazon started operating from Hyderabad.

The graph below shows Hyderabad's software imports and exports from FY 1999-2000 to 2019-2020. There has been a percentage increase of approximately 6564 per cent in software exports and 19.7 per cent in software imports during this time frame. The annual growth rate of software exports is consistently increasing over time.

4.3 Software exports and imports Hyderabad, STPI

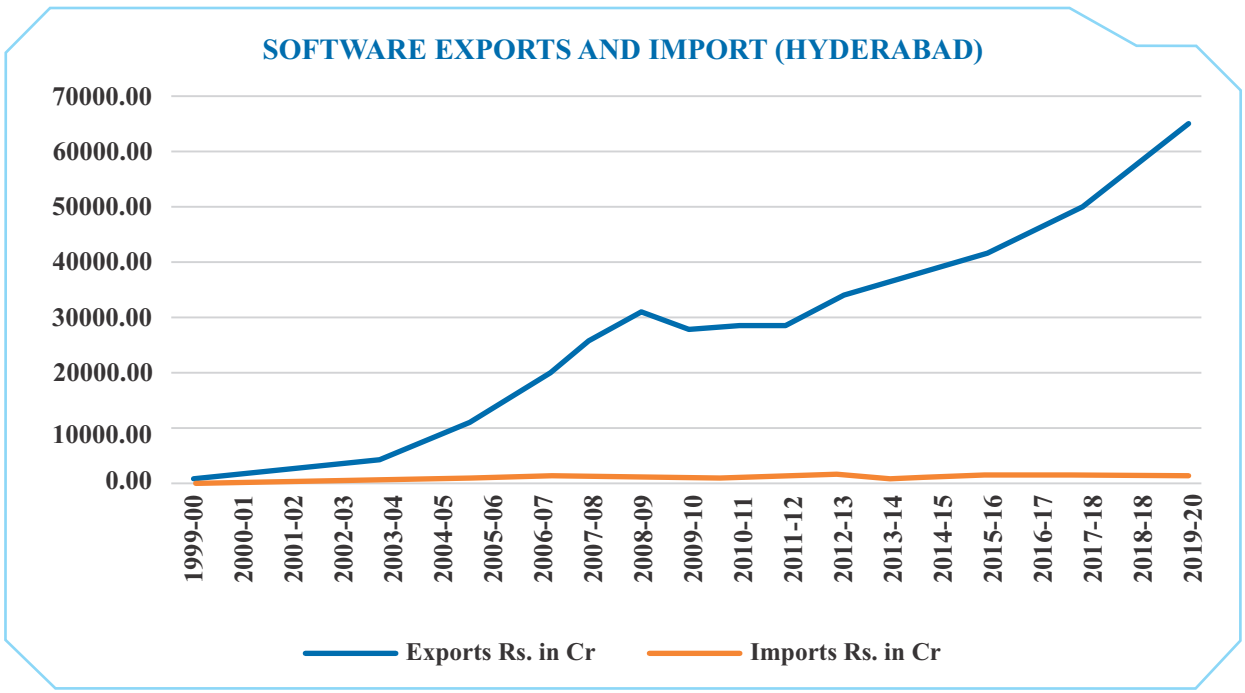


Figure 7: Software exports and imports Hyderabad, STPI [1]

The ICT Policy 2016 of the newly formed Telangana government aims to make Telangana the most preferred technology investment destination.

The objectives of the ICT policy are as follow:

1. To make Hyderabad the national leader in IT exports and leverage the infrastructure to attract more investments.
2. Attract investments to the tune of USD 3 Billion in the electronics sector, create employment of 1.5 Lakhs through the electronics sector in the next five years and enhance the production from approximately USD 1 billion to USD 7.5 billion.
3. To give a boost to young entrepreneurs and to kick-start the next-generation reforms by providing access to critical capital and state-of-the-art physical infrastructure.
4. To enhance the skill level of students in Telangana by imparting necessary technical and soft skills and by tying up the industry and academic institutions through a nodal agency.
5. To take a leadership position in all emerging technologies by creating a conducive environment that encourages product development companies, R&D institutions, SMEs, start-ups to choose Telangana for their units.

1 Note: software exports and Imports are provided in STP units and do not include SEZ units

6. To continue as a leader in the country for e-governance and citizen delivery services and to become a pioneer in — governance and stand as an example to other states and countries.
7. To transform the state into a genuinely digitised region by connecting every household through broadband, by providing Wi-Fi in major municipal corporations and by ensuring 100% digital literacy.
8. To put Telangana on the global map by participating in global roadshows and events and aggressively promoting the initiatives, developments, and opportunities in the State.
9. To put Telangana on the global map by participating in global roadshows and events and aggressively promoting the State's initiatives, developments, and opportunities.

The new state of Telangana was formed on June 2nd 2014. Since the formation of Telangana, the government has accorded the highest priority for the further growth of the IT sector in the state. We can see a consistent rise in Hyderabad's share of growth in the Information Technology sector. In the financial year 2019-2020, Hyderabad saw an overall share of 23.5 per cent in India's IT export growth rate. Telangana's share of India's IT exports for the year 2019-2020 was recorded as 11.6%, a jump of 1 per cent from the previous fiscal year.

4.4 IT/ITeS exports, Electronics and Communication Department Telangana

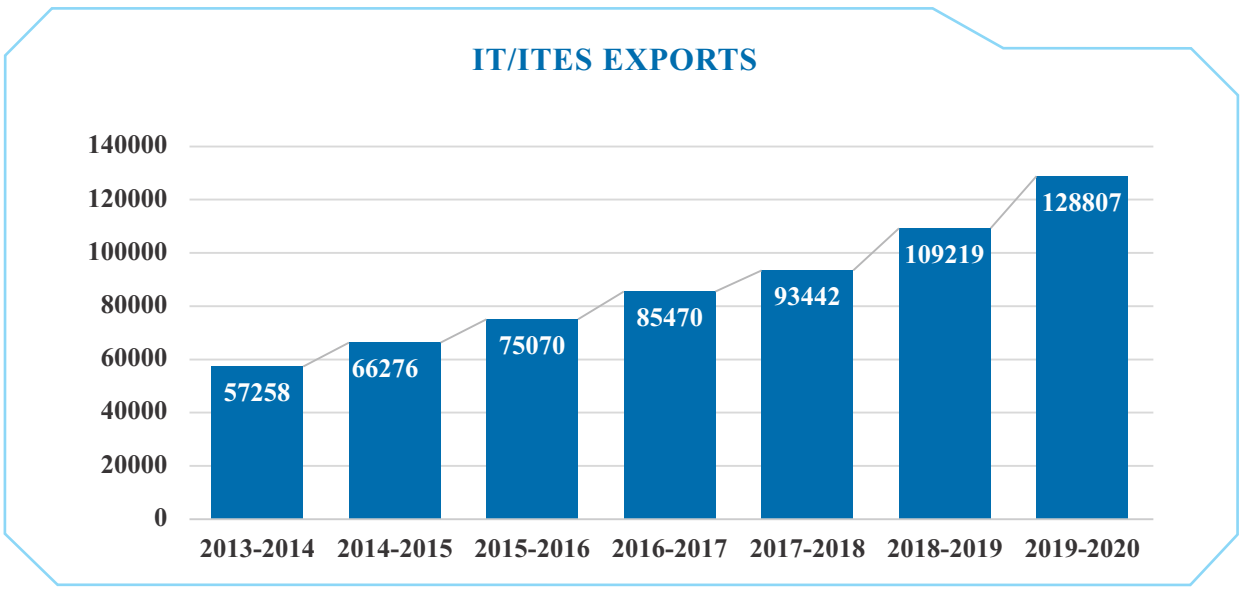


Figure 8: IT/ITeS exports, Electronics and Communication Department Telangana (Annual Reports)

Hyderabad has achieved a growth rate of 17.93% from the F.Y. 2018-2019 to FY 2019-2020

Telangana has seen a growth rate of software exports of more than 100 per cent between the years 2014 to 2020. Telangana's exports in the IT services have doubled over the period. As seen, Telangana's IT sector is mainly led by IT and ITeS companies that were set up in Hyderabad in the 1990s. (ITeS refers to Information Technology Enabled service. It includes a large variety of operations that are dependent on IT to enhance an organisation's efficiency.) According to data collected by Software Technology Park of India (STPI), In the Financial Year (FY) 2000-2001, Andhra Pradesh's contribution to India's IT exports stood at around 10 per cent value of 2017 cr. However currently, Hyderabad has achieved a growth rate of 17.93% from the F.Y. 2018-2019 to FY 2019-2020. Increasingly, Hyderabad is becoming a hub for entrepreneurs and IT/ITeS companies.

4.5 Employment data, IT & E.C. Department, Telangana

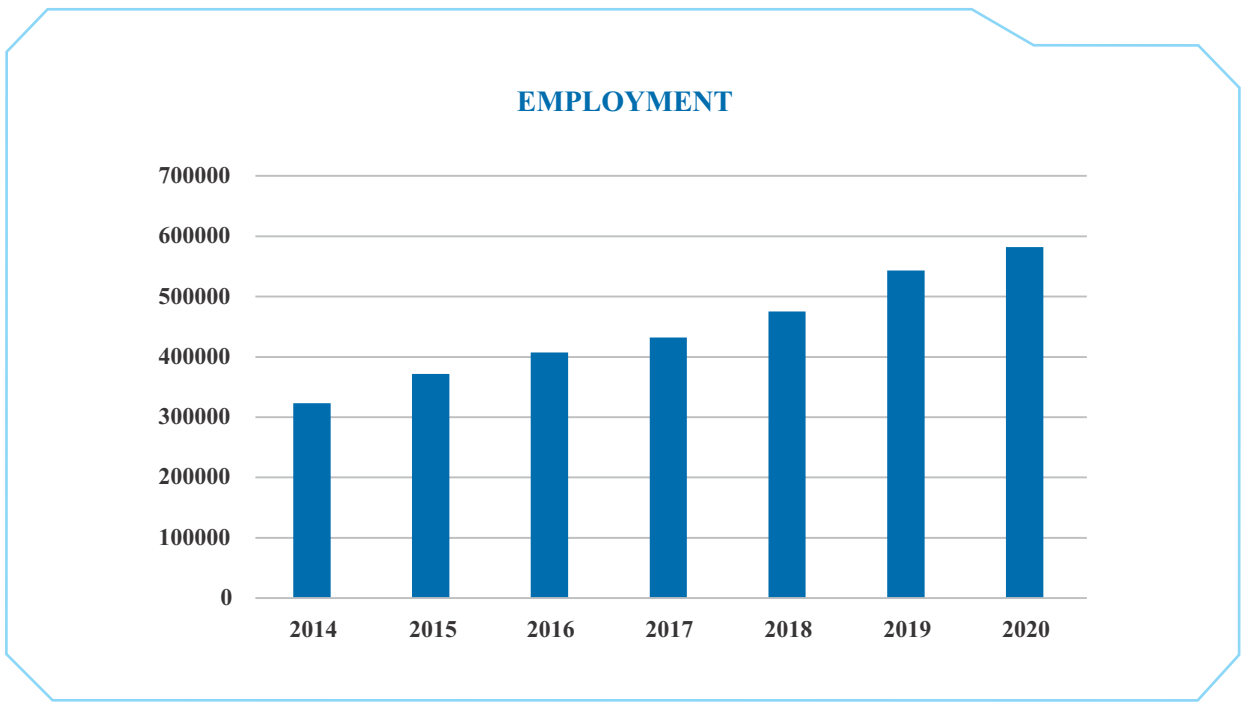


Figure 9: Employment data, IT & E.C. Department, Telangana

The figure above shows that direct employment in the IT sector has increased by 2,58,730 in the last six years. It is a result of the State investing in resources and infrastructure that help employ and enhance the State's IT technology, capabilities, and capacities. The entry of various multinational firms has been very crucial to the success story of Hyderabad. Not only have they increased employment in the State, but they also form a major portion of the software exports that flow out of Hyderabad.

Telangana has seen a growth rate of software exports of more than 100 per cent between the years 2014 to 2020. Telangana's exports in the IT services have doubled over the period. As seen, Telangana's IT sector is mainly led by IT and ITeS companies that were set up in Hyderabad in the 1990s. (ITeS refers to Information Technology Enabled service. It includes a large variety of operations that are dependent on IT to enhance an organisation's efficiency.) According to data collected by Software Technology Park of India (STPI), In the Financial Year (FY) 2000-2001, Andhra Pradesh's contribution to India's IT exports stood at around 10 per cent value of 2017 cr. However currently, Hyderabad has achieved a growth rate of 17.93% from the F.Y. 2018-2019 to FY 2019-2020. Increasingly, Hyderabad is becoming a hub for entrepreneurs and IT/ITeS companies.

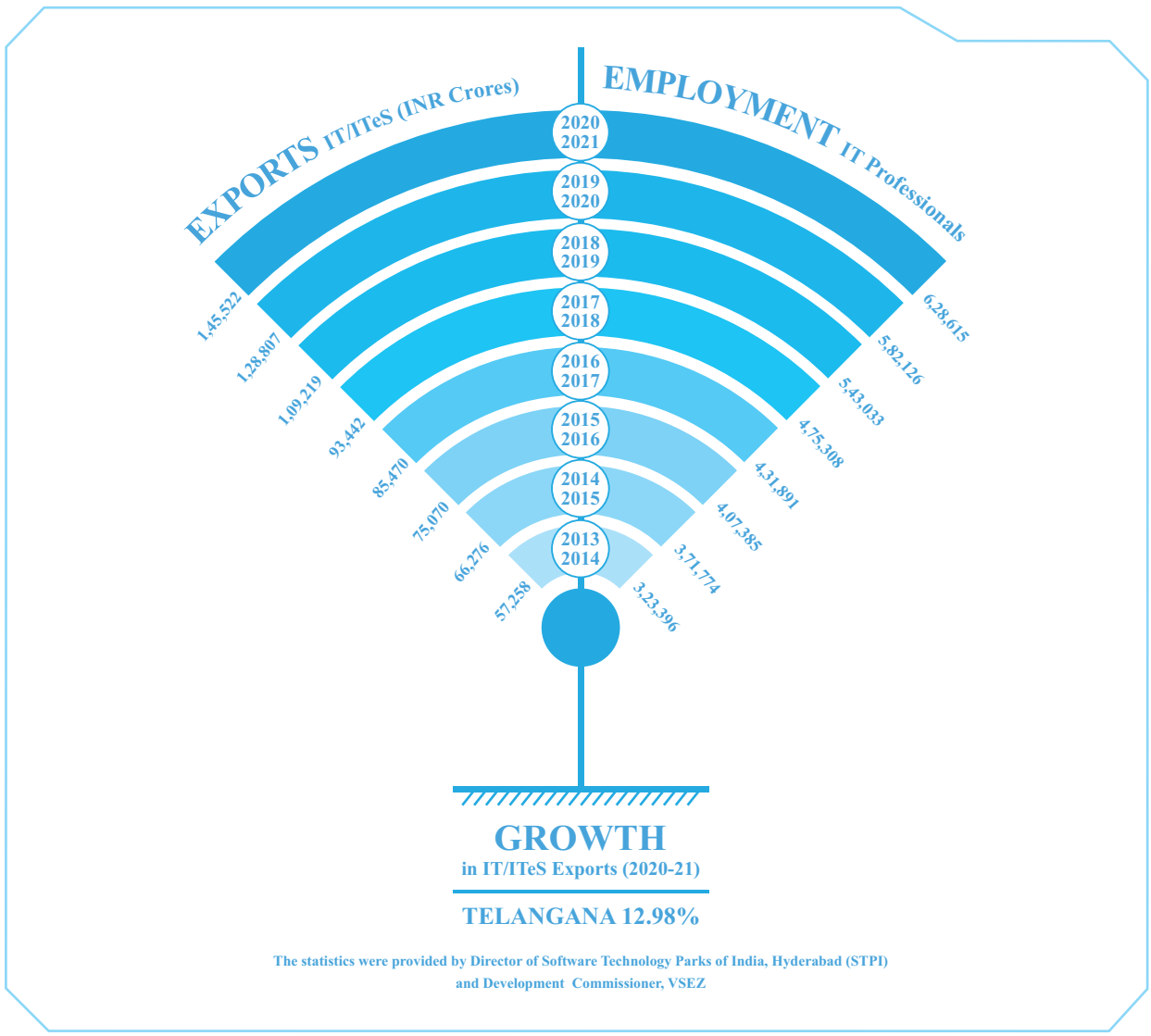


Figure 10: Growth in IT/ITeS exports in Telangana (2020-21), IT, E&C Department Annual Report (2020-21)

Let us look at the Top 50 software export companies in Hyderabad as of 2020.

S. No.	COMPANY NAME
1.	INFOSYS LIMITED
2.	MICROSOFT INDIA R&D PRIVATE LIMITED
3.	QUALCOMM INDIA PRIVATE LIMITED
4.	TECH MAHINDRA LIMITED
5.	DELOITTE CONSULTING INDIA PRIVATE LIMITED
6.	GOOGLE INDIA PRIVATE LIMITED
7.	BA CONTINUUM INDIA PRIVATE LIMITED
8.	JP MORGAN SERVICES INDIA PRIVATE LIMITED
9.	ORACLE INDIA PRIVATE LIMITED
10.	HSBC SOFTWARE DEVELOPMENT (INDIA) PRIVATE LIMITED
11.	DELOITTE SUPPORT SERVICES INDIA PRIVATE LIMITED
12.	VERIZON DATA SERVICES INDIA PRIVATE LIMITED
13.	ADP PRIVATE LIMITED
14.	HSBC ELECTRONIC DATA PROCESSING INDIA PRIVATE LIMITED
15.	MICROSOFT GLOBAL SERVICES CENTER (INDIA) PRIVATE LIMITED
16.	CAPGEMINI TECHNOLOGY SERVICES INDIA LIMITED
17.	GENPACT INDIA PRIVATE LIMITED
18.	ACCENTURE SOLUTIONS PRIVATE LIMITED
19.	IBM INDIA PRIVATE LIMITED
20.	DELL INTERNATIONAL SERVICES INDIA PRIVATE LIMITED
21.	XILINX INDIA TECHNOLOGY SERVICES PRIVATE LIMITED
22.	DELOITTE TAX SERVICES INDIA PRIVATE LIMITED
23.	DELOITTE &TOUCHE ASSURANCE AND ENTERPRISE RISK SERVICES INDIA PRIVATE LIMITED
24.	TATA CONSULTANCY SERVICES LIMITED
25.	CA (INDIA) TECHNOLOGIES PRIVATE LIMITED
26.	S&P CAPITAL IQ (INDIA) PRIVATE LIMITED

S. No.	COMPANY NAME
27.	SYNCHRONY INTERNATIONAL SERVICES PRIVATE LIMITED
28.	VIRTUSA CONSULTING SERVICES PRIVATE LIMITED
29.	DE SHAW INDIA PRIVATE LIMITED
30.	STATE STREET CORPORATE SERVICES MUMBAI PRIVATE LIMITED
31.	AMAZON DEVELOPMENT CENTRE INDIA PRIVATE LIMITED
32.	AMD INDIA PRIVATE LIMITED
33.	BROADRIDGE FINANCIAL SOLUTIONS INDIA PRIVATE LIMITED
34.	DXC TECHNOLOGY INDIA PRIVATE LIMITED
35.	INFOR (INDIA) PRIVATE LIMITED
36.	BLUE YONDER INDIA PRIVATE LIMITED
37.	HEXAGON CAPABILITY CENTER INDIA PRIVATE LIMITED
38.	ORACLE SOLUTION SERVICES INDIA PRIVATE LIMITED
39.	NETCRACKER TECHNOLOGY SOLUTIONS INDIA PRIVATE LIMITED
40.	EPAM SYSTEMS INDIA PRIVATE LIMITED
41.	IVY SOFTWARE DEVELOPMENT SERVICES PRIVATE LIMITED
42.	SYNOPSYS INDIA PRIVATE LIMITED
43.	HONEYWELL TECHNOLOGY SOLUTIONS LAB PRIVATE LIMITED
44.	HYUNDAI MOTOR INDIA ENGINEERING PRIVATE LIMITED
45.	LSI INDIA RESEARCH & DEVELOPMENT PRIVATE LIMITED
46.	WIPRO LIMITED
47.	THOMSON REUTERS INTERNATIONAL SERVICES PRIVATE LIMITED
48.	SATYAM VENTURE ENGINEERING SERVICES PRIVATE LIMITED
49.	FMC TECHNOLOGIES INDIA PRIVATE LIMITED
50.	CYIENT LIMITED

These top 50 companies are the major software and ITES/BPO, exporters. Hyderabad's IT industry mainly functions by its IT/ITeS exports. Since 2014, the annual growth rate of Hyderabad's exports has been around 7 to 9 per cent.

Telangana has ranked sixth in export preparedness, while Karnataka ranks 9th.

A majority of these companies are private limited firms. All of them are multinational firms, out of which a majority of them have their headquarters in the United States. Seven, among the Top 50 companies are Indian foreign affiliates, with headquarters in India and global operations. Out of these seven, 2 of them are firms that find their origins in the entrepreneurial state of Hyderabad, this includes Satyam Ventures and IVY software development services. These findings resonate with the overall annual computer software reports of the whole of India.

5. Conclusion

London and Partners (L&P), an international trade, investment and promotion agency did an analysis in 2018, and ranked the top 20 global cities that successfully attracted foreign direct investment (FDI) over a ten-year period into the information and communications technology sector. While Bangalore ranked 6th, Hyderabad ranked 14th in attracting FDI in the ICT and electronics sector, with 20 companies investing in the course of 2018. This is an indicator of Hyderabad's transition to becoming the IT capital in India.

There are several reasons why large multinational companies choose Hyderabad and see its potential as a technology giant. Telangana has ranked sixth in export preparedness, while Karnataka ranks 9th. The world's top five majors have chosen Hyderabad to establish their facilities. With the constant support the State government, Hyderabad has become the hub for global IT companies.

SECTION - 3

THE START-UP CULTURE OF TELANGANA

An overview of the ecosystem

This section of the report tries to understand the start-up climate in Telangana. It draws the state's compatibility and conduciveness for IT start-up growth through primary qualitative interviews of local IT business entrepreneurs.

Introduction

Innovation, creativity, and entrepreneurship are essential milestones of the growing success of all developed nations. Start-ups and innovations have played a crucial role in transforming economies throughout the world. India has started a similar journey around the same time as the United Kingdom, making India a leading start-up hub. India aspires to become a $5 Trillion economies by 2024. India wants to take advantage of its demographic dividend and convert it into high quality technical human resources by encouraging deep-tech entrepreneurship, research and innovation. The government of India first announced the Start-up action plan in 2016. India aspires to move its Global Innovation Index (GII) ranking within the top 25.

India has the advantage of an enormous vibrant market. A population base over one billion, raising technology embracing entrepreneurs, pervasive tech innovation, growing middle class and simultaneous growth in consumption index, strong agriculture and industrial roots, high saving rate, increasing infrastructure and digital infrastructure, favourable regulatory (state) environment, falling cost of doing business, expanding investor group and next-generation technologies making India competitive and a hub for new generation Unicorns and Soonicorns. To add to India's achievements, it added 8 Unicorns in 2018 alone, and it is home to 26 Unicorns.

Celebrated start-ups in India are spread across various sectors such as Agriculture, health, logistics, Banking and Finance, Education, E-Commerce, Food, Insurance, Media, and Entertainment. Bookmyshow, Hotstar, Policybazaar, Paytm, Swiggy, Zomato, Licious, Flipkart, Nykaa, Byjus, Unacedamy,

Practo, Curefit, AgroStar, Ninjacart are some of the notable start-ups. The state actively facilitates and nourishes entrepreneurship to young, ambitious entrepreneurs by creating a viable ecosystem to boost start-up culture.

Insights from Hyderabad's entrepreneurs

1. An Upcoming Unicorn - 1

Chaitanya Peddi is the co-founder of Darwinbox, a technology start-up based out of Hyderabad. He shares his insights, start-up journey and throws light on the start-up culture, ecosystem, and the need of the hour for the industry in the city.

1.1 What worked for Hyderabad in the early 80s and 90s

Chaitanya throws light on why he believes Hyderabad got the boost as an IT industry hub.

One of the main reasons for Hyderabad to climb the ladder of success was that, running a company was much cheaper in Hyderabad than in Bangalore in the early phases of the IT boom. Real estate was a challenging and a costly affair for companies to set up shop, and in a relative sense, Hyderabad had a cost-advantage in terms of availability of land and the prices. The other factor was the talent pool. The hypothesis (earlier) that Hyderabad was not the place to find tech talent was slowly proven wrong. Chaitanya credits the IT boom in the state that happened post the 90s, to the visionaries for starting premier educational institutions such as the IIIT Hyderabad, eventually the IIT Hyderabad, and other quality engineering colleges. Both Jawaharlal Nehru Technological University JNTU and Osmania University OU too provided tech-graduates.

Real estate was a challenging and a costly affair for companies to set up shop, and in a relative sense, Hyderabad had a cost-advantage in terms of availability of land and the prices.

1.2 The Darwinbox journey

While reflecting on his journey with Darwinbox, Chaitanya says the success of any start-up company is primarily based on fresh talent. In most companies starting up, finding senior professionals at the outset is difficult given the affordaility of the same. It is only much later that the hiring becomes easier once the company is established with a stable setting and decent funding. But till then, it always is a task.

In the beginning, the biggest problem for a start-up is not the idea but the execution, Chaitanya says. The survival of a start-up depends on implementing the vision and staying afloat once it is executed. The key to a smooth and decent execution is a good team. It is critical to get good people on board; attracting big

names will always be a task, and mostly one can get them as founding members or as board members, but the team that works with you every day must be good .

Darwinbox, like any other start-up, began hiring fresh graduates, and the majority of them were from in and around Hyderabad. They were from good institutes, might not have been tier-one and tier-two colleges, but their talent and hard work were at par with those of top-ranked institutes, he says.

1.3 Why do cities become or are start-up hubs?

Chaitanya points out that cities like Bangalore and Delhi have become start-up hubs and that their weather or connectivity is not critical for their success. He says the city's vibe attracts people; he calls it an almost invisible and inherent nature of the city that draws people in. Entrepreneurs go to such cities to begin their journey and set up their businesses, and one by one, the ecosystem builds. The ecosystem expands as people settle down from other cities or the parts of the country, maybe even other countries. While good residential facilities, good schooling for kids are crucial for a city to become the destination for entrepreneurship, it is the lower operational cost and the city's infrastructure that becomes essential to its growth.

An almost invisible and inherent nature of the city that draws people, especially entrepreneurs in.

Speaking of Hyderabad and Bangalore as the new start up hubs, Hyderabad has established a good foundation in terms of quality of life, infrastructure facilities in residential facilities, educational facilities, entertainment and social life. Also, the competitiveness of getting school and college admission is much lesser and evenly distributed in Hyderabad than a Delhi or Bombay.

Establishing a cosmopolitan brand is vital to establish that culture, and according to him, Bangalore has done an excellent job. The efforts started much earlier than other cities due to Mr S M Krishna the former Chief Minister of Karnataka, who proactively sought companies to set out a base in Bangalore.

1.4 Hyderabad's potential to be No.1

Curating a city as a hub for a particular industry is difficult when it is starting from scratch. Getting the first hundred companies to establish is an arduous task but post that it’s an organic progression.

The ecosystem will start to established once the talent pool is supported and nurtured.

For Hyderabad to grow as a start-up hub, he says, it is an image and vibe that needs to be created. The ecosystem will start to get established once the talent pool is supported, and the vibe shall

come in automatically. Infrastructure, he believes, has become very saturated in Delhi and Bangalore, and there are many issues with the traffic and city's infrastructure. In comparison, Hyderabad has excellent potential and the city's infrastructure can be leveraged to build on the ecosystem.

As a citizen of the state, he is pretty happy with the current government's continuous investments in improving the city infrastructure. From widening of the roads and building specific flyovers to minimise traffic, significant investments are already on-going. One might not see that as an immediate benefit, but they are very important.

Hyderabad still does not figure as the top three destinations for an entrepreneur to choose for setting up a business but can make its place on that list. The key to creating that image is marketing and branding, he says.

Another aspect is real estate, it is a challenging and costly affair. Although the government is developing innovative solutions like the T-Hub. In Hyderabad, more can be done to provide spaces to upcoming companies at subsidised prices. Currently, because there is potential in the city and there is growth, real estate prices are soaring as well.

What is required is subsidising infrastructure, ease in manoeuvring paperwork and compliance. Each state has an amicable policy for attracting companies to set up, but the issue is execution. Once that process is made straightforward, it will draw entrepreneurs to the city to set up. He says that creating an easy, hassle-free, bureaucratic free online process for compliance will straighten many things up. Giving an example, he says that is how Singapore as a nation was built.

The industry needs investors, angel investors, venture capitalists to come to Hyderabad and have meetings and meet-ups in the city instead of being called to a Bangalore or a Delhi each time a discussion needs to happen. That ecosystem building of dialogue and meet up culture needs to be encouraged and curated.

2. An Upcoming Unicorn - 2

2.1 Founders of DreamVu

Rajat and Rohan, the founders of the Hyderabad-based start-up DreamVu, share their insights and experiences concerning the start-up culture and the importance of creating a sustainable ecosystem to foster further industry growth.

2.2 A brief look into DreamVu's journey

Starting in 2017, DreamVu began its journey and ventured into the industry. For the most part, the confidence and backing for both its founders was their association with the International Institute of Information Technology (IIIT) Hyderabad. Rajat and Rohan are alumni of the IIIT Hyderabad, a Bachelors in Technology and a Master of Science, adding value and credibility for two young entrepreneurs making their way.

They get right into the conversation and throw light on their perspective of the start-up culture in Hyderabad, Telangana.

2.3 The critical requirements for start-up growth

Rajat, has had first-hand experience at the encouraging bits and the hurdles in setting up his business. Talking about his journey, Rajat acknowledges upfront the advantage of being from a premier technology institute that provided goodwill and mentorship in the initial days. The support provided by the institution, which probably no other institute, even an IIT Hyderabad, could provide, in terms of guidance, credibility to approach investments.

Around 2017, the T-Hub was brewing into existence and was a boon for Rajat and his co-founders. A path was laid out, and they were not wholly clueless, he says. It provided direction which led them to going through the incubator, pitching it to multiple investors, and getting their first very small Angel cheque.

But he points out that there were very few angel investors one could approach for seed funding at the time. But it is not only the funding that is key for a start-up; it also requires mentorship. Rajat and Rohan feel a shortage of advisors in the industry compared to cities like Delhi, Mumbai or Bangalore. They say Hyderabad has quite a few start-ups coming up but not as many as we would like to see; not all get the proper guidance and mentorship, especially for deep-tech companies. Every start-up can get that first funding or first mentorship. They agree that it' is all about the idea, and if you' are not able to pitch, that is a problem, but it is also about the execution. The execution requires mentorship both in the technical aspects as well as the business aspects of things.

It is not only the funding that is key for a start-up; it also requires sound mentorship.

Start-ups can join these incubators and tie-up with investors looking for fresh ideas and investment opportunities. Rajat says that the professors and faculty can help these start-ups on some basis as well. So these are these cross model things happening that are part of that ecosystem building.

Rajat illustrates an example, if one has to approach a potential customer, which most probably will be a big company. And if we go through an advisor, where this person sits on, on the Advisory Board the company will take a look at the idea and will believe you when you are there to pitch, it is all about credibility. When you (start-up) are starting, you may have an excellent idea, but one needs to build credibility and credibility at an early stage can only come in through an advisor. To convince the invester that the vision the start-up has is a solid idea and not some fluke that two guys have started out and then end up wasting everyone's time.

Rajat looking back tells us that they had a lot of advisors in the early stage from the Centre for Innovation & Entrepreneurship (CIE) from T-Hub. They could help DreamVu in the right direction. They could help them with the first contacts they needed, build the product and then take it to the first few customers. He believes some of these challenges were significant and unique to DreamVu, as there are significantly fewer hardware companies in the city.

2.4 The lack of hardware companies and technical support in Hyderabad

The software boom has occurred, but the hardware space is still unexplored in India and definitely in Hyderabad, says Rajat.

The software boom has occurred, but the hardware space is still unexplored in India and definitely in Hyderabad

We (Hyderabad) lack a hardware ecosystem. Hyderabad does not have any support for hardware start-ups in a sense; we have a 3D printer at some location, but to be very honest, that is not really support that is a 3D printer, says Rajat. He says it is all about the race, and if Hyderabad wants to be in the race, it has to be equipped and ready to provide for the requirements.

Going to the base of education, Rajat and Rohan reflect on their alma mater, and that is another story because IIIT does not have any hardware engineering interpolating. There is only software like courses; it is more like a software institute.

The hardware support one looks for is missing; when they were building the camera, they created the technology that was working, which was published and patented in conferences, but they did not have any resources to make this camera.

Although they were at IIIT, Rajat had to go back to the basics and learn optics to build the camera. He says, in that situation, he had to be a maker; he could not just be writing code. With the very nature of IIIT's bachelor's degree and the courses as a computer

science graduate, he was made to believe that he should only be writing code.

To learn these optics and get a hands-on job building the camera, he went to the Engineering Staff College of India (ESCI) in Gachibowli. There they had a couple of 3D printers and actually printed their optics using 3D printers too, and it took around two months, three months. The ESCI helped print a couple of mirrors as a trial, and it helped out a lot for no fee or cost.

The next place for any hardware support he mentions is the IIT (Indian Institute of Technology) Hyderabad; they still have a hardware centre. And they have faculty who can help with the PCB (printed circuit board) and electronics. They collaborated with them (IIIT Hyderabad hardware centre) to bootstrap and got support from IIT for a couple of months.

After reaching a particular stage and receiving funding for the innovation, the next step is manufacturing the product. But where are the manufacturing centres?

Hyderabad, he says, should aim to create more hardware centres for incubating start-ups and manufacturing hubs.

2.5 Talent pool and the hiring conundrum

One more thing primarily related to a start-up may not be challenging for big companies, but hiring is very difficult for start-ups.

The talent pool of Hyderabad is significantly less, mainly for the tech companies as compared to the other cities. Rajat says this makes him very jealous because he cannot go to Bangalore. After all, he was in Hyderabad and because of their support from IIIT and their family also here, and they already have a team,. But he belives that hiring is a challenge.

He says, maybe because there are many people already there in Bangalore and Delhi and Mumbai. And people are not willing especially during COVID; it has become so difficult because people are not ready to move, and, people want to work from home. Some companies are giving that liberty and probably can do so. But for a small company, such as his it is not an option, especially while building and making things are involved.

Although Hyderabad has grown a lot in the last five years, there is still a need for improvement keeping in mind the SMB (Small and Medium business)

It is not just going to work with them; hiring is a challenge for Hyderabad. It may be because we (Hyderabad) have less of an ecosystem, and we are not like a Bangalore where it is a whole

idea, a whole idea can be pitched and executed in one city. Although Hyderabad has grown a lot in the last five years, there is still a need for improvement because SMB (Small and Medium business) have to work ten time harder than the big companies to hire good talent. And to do it from Hyderabad is a more significant challenge.

Companies cannot force people to come from other cities, they say, even if you pay them whatever they ask, it is not going to work efficiently.

But it is tough here in Hyderabad because every type of company is in Bangalore and hence it becomes easy to opt the latter. They (DreamVu) have also come to an extent where now they have thought of opening up one office in Bangalore just to be there. They do not want to miss good talent, and when they are working quite hard, the same computer story of the 1980s, they do not want to miss the train just because they are in Hyderabad and not in Bangalore.

And if the talent is there in another city, maybe they can set up a space, but setting up an office is not a problem. Then managing and the cost of that space is expensive, and from the perspective of a small and medium-sized business, it is unreasonable.

2.6 The boons of the Bay: Drawing parallels with the US

Both Rajat and Rohan draw parallels to the US and the Silicon Valley, most commonly known as the Bay area. There is scope for many tech meetups in the US, which is quite common and a part of the start-up ecosystem. They describe it as almost a hobby or a walk in a park; if you are bored or looking to do something, one could just walk right into one of these tech meetups as they would happen just that often. And these were attended by the top innovators in the world. Each day one can just go to the best meet up out of Stanford and Carnegie Mellon.

These meetups are especially great for smaller businesses. All the giants and the people who have pioneered in the field would be present and the informal set up makes it easier to build networks and contacts. Unfortunately, the element of the start-up ecosystem is missing in Hyderabad. It exists partially, if not wholly, in Bangalore.

But Rohan points out of his personal choice and past experiences with Indian investors that he would not approach any of them at the first go. He says that the culture of bringing larger entities,

CEOs, and investors to such meetups has not been curated in India.

2.7 It is all about the ecosystem

The good thing about Hyderabad is the weather, they say. Compared to the fluctuating weather conditions of Gurgaon or Delhi, extreme weather can be seen days apart.

They do not think a company or a product like a camera at DreamVu can be built in such situations as they have to do a lot of testing. And almost 10% of their team just have to run all the time. In a sense, keep working here and there and capture images in different lighting, different scenarios and all those things. The weather and working conditions become extremely important for the team to work.

Unfortunately, the element of the start-up ecosystem is missing in Hyderabad.

The other significant benefit that Telangana and Hyderabad have to their credit is the electricity element. Being situated in Hyderabad as a tech start-up helps with fewer power disruptions than in other cities.

They also talk about the COVID situation and reflect that it was not very bad. The Telangana government did an excellent job in they manner in which they imposed the lockdown, compared to the other cities where start-ups were shut entirely. No employee was ready to come to the office even after the lockdown lifted, which impacted the growth of the start-ups.

Regarding the COVID situation, the Telangana Government did all excellent job.

Whereas in Hyderabad, people were relaxed because it was not as bad as other cities. Especially for hardware start-ups, where working from home is not an option. The team needed to be physically present; even if it was a few days a week, tasks had to be done at the office.

In Hyderabad, especially this area, the T-Hub, Gachibowli etc, where once only a Microsoft and ISB stood, everything else was barren. And now slowly the growth is visible, says Rajat. Several companies are coming up also in terms of the living spaces and societies one can see the development

In terms of social life, the restaurants, the clubs, and nightlife are improving in the city, which is an essential factor for the industry. These social additions are vital in attracting more talent to move to Hyderabad. Because if you give me a place to go to Friday night in Bangalore and you don't give me that in Hyderabad, I won't be here, says Rajat.

If we do not solve this, the problem of not having and not creating an ecosystem very quickly, Hyderabad will be left behind very soon. There is so much development happening in Pune and Gurgaon and other places that Hyderabad will just be at the bottom of the list.

3. Issues for entrepreneurs, ecosystems issues, employees' issues

Ashhar Farhan speaks about some of the issues faced by young students and technology enthusiast in terms of cultural conditioning for entrepreneurship.

Cultural Conditioning

India is still wallowing in extreme poverty; amidst this, to imagine entrepreneurship is a challenge especially the sort of entrepreneurship that requires investing patience and time into it.

Due to the lack of a social security net in society, young people feel the need to become the social security net for the family quickly.

More times than not, young persons, who are talented, intelligent but eager to encash their talent and skills quickly would much rather work for a larger company. A company that might not give autonomy or space to be creative but gives enough in its pay package to keep running their lives and "settle down" to take care of other aspects of their lives.

Due to the lack of a social security net in society, young people feel the need to become the social security net for the family quickly. The grind begins as soon as one finishes their engineering degree or any other degree for that matter, to secure a high-paying job rather than spend a few years experimenting and exploring one's skill set and passions.

Entrepreneurship typically, he says, happens in one of these two phases - before having children or after a particular retirement age (with a secure life lived and comfortable lifestyle there is an option to step out and experiment with something new). There is a valley of death between these phases where one can often not try anything on their own. Even if companies that do "start-up" do not have the patience to go through the process. Entrepreneurship requires patience.

Dialling the clock back to his parents, Farhan says his generation had an edge. He and the rest of his batchmates did not have the burden of taking charge of their home and supporting their families as their parents had their respective pensions to carry on the responsibilities. Hence, the pressure and dependency on a fresh graduate or a youngster were far less than it is today. The

space for exploration is shrinking; whether one is an IIT graduate or IIM, everybody is eyeing to get a high package job. Today there are many pressures; therefore, the fresh graduates, young professionals cannot breed entrepreneurship. This has become part of our culture, he says. It is implicit in the way we function; there are code words such as, "why don't you settle down now", "mother/father is having health issues."

India is not geared to be an entrepreneur-friendly country, Farhan shares an anecdote from his recent experience as an established entrepreneur.

1. Imagine one has to set up a Tea stall; it requires seven government permissions!

Permissions from the fire safety department, the Municipal Corporation, trade license, Food Safety and Standards Authority of India (FSSAI) registration within FSSAI require separate clearance for the ingredients used, police clearance, a nod from the neighbour, weight and measures clearance.

There is no way to be patient through all these processes and no guarantee at the end for a go-ahead. Farhan uses his example, being reasonably privileged and with connections, he too cannot obtain these licenses and permissions. It would be almost impossible for any newcomer, which puts them technically on the wrong side of the law. So much of the entrepreneur's energy goes into dealing with the procedural and bureaucratic processes; it wears them out.

2. Access to capital is almost impossible

Access to capital is difficult at various levels. If one has a house and would like to take a loan against it, a minor glitch in the house's paperwork stops the whole process, that is, if one owns a house. Most people do not own a house of their own. Furthermore, if one does not own a house, one cannot approach the bank for a loan. In order to approach a bank, one should have social privilege, says Farhan. It is tough to raise money in India, and banks in India do not hand out risk money but only loans.

Access to small capital is challenging here in India; a mere 3-4 lakhs funding is tough, might as well seek out 20 crores, says Farhan. The US government and the banks function quite differently. Several groups and associations help companies raise funds in a matter of days. In contrast to the Indian government, where there are many schemes, none of them are helpful. Several red tape issues make it impossible for an ordinary person to get through.

3.1 Why does Hyderabad have no Unicorns?

The cultural problem with Indian start-ups is that it has Indian specific problem solving/solutions. The issue goes back a few decades, says Farhan, to the times we were a closed economy and tended only for our own needs. We as Indians, he says, do not know what it takes to make a global product. For instance, on Google we will not find the founders picture on the about us section, but an Indian start-up website will pop up a founder's picture.

The global market is quite different, and it requires a very different mindset to produce products globally. It needs an understanding of various cultures and the consumer base for product design and development. He says it is unfortunate that many mentors can guide start-ups in product development for the global market here in India, especially in consumer-end products.

The caste issue

Addressing the elephant in the room, Farhan points out a crucial element of caste in the start-up business. Many companies are limited to members or entrepreneurs belonging to the same caste. He says the "Unicorns" of India such as Flipkart, Swiggy, OLA; it is interesting to look at their founders' caste composition. If they belong to the business community, access to funding and capital in the initial phases is more accessible than for most.

Business communities in the caste hierarchy usually find the initially push to venture into business. But a common problem faced by these start-ups, in the long run, is getting senior people of the same caste. Slowly he says the focus shifts and value creation takes a back seat.

4. Small Business's Conundrums

Inder Sen Nandigama and Santosh Kumar Surabi are entrepreneurs in Hyderabad. They share their insights of their journey, challenges and perspectives as business owners

4.1 The Hyderabad story

In the last couple of years, the culture of start-ups and the acceptance of start-ups and the attitude of taking the risks have has gained momentum. The idea that there is a high percentage of failure and is nothing wrong if a start-up has failed and the entrepreneur has moved on to another venture, has become mainstream. For a technology start-up as such, not much has changed within Hyderabad. From an operations point of view, or

even from an incentive's perspective it did not go in the worst direction, neither did it go in a very positive direction. But they believe that the Telangana Government did play a significant role when they established the T-Hub and they started giving funding and office space. The incubator has helped the start-up culture come into mainstream industry

4.2 What challenges do new businesses face?

The challenges stemmed mainly from compliance and making sure that there were no problems in any of the departments. Compliance is tedious and as first-time business owners it is quite taxing and the focus shifts from the product creation. They both agreed that there is much to learn from Nordic countries. We must borrow practices regarding how the businesses are run there how the culture has been curated. Ease of doing business does not come under the purview of state government and is left to the directives of the Central Government. It is difficult for a start-up entrepreneur who is just bootstrapping their start-up to keep track of regulations. There have been improvements over a period of time, but there is scope to improve more. Compliance is a hassle for small businesses because they do not have manpower in the company to make sure that they keep all the things in order.

Compliance is tedious and as first-time business owners it is quite taxing and the focus shifts from the product creation

The Government is trying to include a single window to comply to all these surges but they are not yet there.

4.3 First-time Entrepreneurs

A first-time entrepreneur is constrained by limited knowledge. Young entrepreneurs do not know the value of adhering to the law. They are unaware of things that need to be done, for instance payment of Tax deduction at source (TDS), knowledge of dividends etc. Despite having strong and structured processes in place, there is an absence of knowledge. That awareness is restricted to CAs and CS. In their opinion, the access is not very structured.

A new entrepreneur needs to have knowledge about what it entails to start a company within the purview of the law. What is allowed in terms of opportunities and how to be compliant within the existing legal framework, these aspects are all structured according to the Government. However, an element of complexity exists. This can be attributed to the fact that thousands of different types of businesses, variations of people are trying to come together and work. But the complexity arises because the information asymmetry, the entrepreneur loses out. Entrepreneurs have to fully depend on hired professionals. And as in the case of

small-businesses, they cannot afford to have a full-time accountant or other extra personnel in the nascent state of their start-up.

An entrepreneur who does not have a history of business in their family or in previous experience is at a disadvantage regarding the know how's of the business climate.

Sometimes a small service such as professional tax is minimal, however, the hassle involved is huge. The framework that dictates compliance is absent. A major reason for the complex web is the lack of communication between departments because of the simple reason that states deal with some domains and a majority lies with the center, they say. There exists information asymmetry between the departments. Hence, a unified portal is not an easy task.

The entrepreneur has to be proactive. It is key for building a business.

The problem is not that the Government is not announcing this information, they do announce, but an entrepreneur is not going to sift through so much detail. The entrepreneur has to be proactive. They strongly believe that ignorance of law has no value in the court. The general sense they feel that the entrepreneurs do want to be compliant but they have no single point of contact to register a company to be compliant with all the company laws.

Another issue faced by small business is they cannot afford to spend time participating in a contractor tender. There is a lot of upfront work that goes into it without which one would not get the project. It is easier to know everything about it if it is in one place. It becomes easy to shortlist and to then allocate funds to projects.

T-Hub has definitely been very helpful. They have constantly conducted and created events. T-Hub has designed events around how to set up a business or running a business. These events are very broad, lranging from something very specific related to technology, or it can be something broad related to running the business. T-Hub it should be available literally every other place in Telangana.

There are a lot of formulas and laws related to logistics and so on which have come up. That level of insight into registering a company or running a business out of a 2-tier city in Telangana are unavailable.

4.4 Bangalore vs. Hyderabad

The laws in both cities are different.

The difference between Hyderabad and Bangalore is more about the ecosystem, not something to do with the Government as such. In Bangalore, one is building something we have already been built into. The simple reason is the absence of an existing product-based company that has made it big in Hyderabad. If there was one company or couple of companies which become big from Hyderabad, which are product-based companies, then the alumni of those companies would actually come out and again start.

So, if you have a product company where you have that kind of employees in the vicinity. The next product company might come along in the near vicinity. Either the founder of the new company is already an alumnus of that previous company, or at least the founder of the new company knows that he or she can attract employees from the existing product company to come and work for them.

Hyderabad needs to have a very good product-based ecosystem for new product-based companies to start. It's not something that can be artificially done.

The people are what is lacking, who have experience in working in product-based companies.

The physical infrastructure side is the same for Bangalore and Hyderabad. The missing ingredient is the people and the existing people who have experience and can mentor in creating that start-up. If you look at Bangalore, the story started in the 90s. The software story Hyderabad story started not in the 90s but in the 2000s.

The artificial influx was created with software. A few large companies were plotting here. But only those large companies continue to exist.

4.5 The ecosystem related to investments like venture capitals or Angel investors

The investors and venture capitalists are only one to 10% available here in Hyderabad, the rest are in other IT cities of Delhi, Bangalore, and Mumbai. It makes it easier if all these things are in one place, the infrastructure, human resource, investment opportunities and so on, logistically speaking. To approach investors and venture capitals to talk to them to keep meeting them and get the funds and the roll out.

We need to wait for a few more years for certain unicorns to come out of Hyderabad, they say. Government should definitely invest in and limit specific projects to only start-up. There are quite a few products that are small, quick to do and definitely something which a start-up size company can execute. Such products should be limited to start-ups participating in government contracts.

IMPACT OF COVID ON TELANGANA'S IT SECTOR

At the beginning of 2020, we saw the rise of the menacing coronavirus, which started in China and eventually spread across the globe, causing widespread chaos. COVID-19 has forever changed the meaning of what used to be normal. Over time, we experienced the severity of this disease with new waves and outbursts. Since the inception of the pandemic, we have seen massive disruption in the routine functioning of almost every aspect of our lives. The COVID outbreak severely affected markets, businesses, and industries across all verticals. Industries, including manufacturing and production units, had to halt their processes. In the corporate domain, Work from Home (WFH) model was adopted at a massive level. This sudden change affected the productivity, morale, and health of the employees in various ways. The IT sector, with a huge corporate workforce, adopted a similar model.

The COVID-19 shock had adversely impacted economic growth all over the country. According to the Ministry of Statistics, India's growth in the fourth quarter of the fiscal year 2020 went down to 3.1%. The World Bank and other rating agencies had initially revised India's growth for FY2021 with the lowest figures India has seen in three decades since India's economic liberalization in the 1990s. India's GDP dropped by a massive 24.4% during April to June 2020 which was the largest GDP contraction in country's history.

However, Telangana's economy showed impressive resilience during the pandemic and balanced the aspects of saving lives and sustaining livelihood. The state's death rate (0.5%) was lower than that of the rest of the country (1.4%). According to Telangana Socio-Economic Outlook 2021, the economic output in Telangana measured by Gross State Domestic Product (GSDP) was ₹ 9.78 lakh crore, and only fell by 1.26% in 2011-12 prices. In comparison, the real economic output at the national level fell by 8%. The resilience was led by the agriculture and allied sectors, which grew by 20.9%, dwarfing the 3% growth at the national level. Although the industry and services sector contracted by 5.6% and 4.9% respectively, they still fared better than the much steeper contractions at the national level. Per capita incomes in the state continue to be higher than at the national level. In 2020-21, the per capita income in the state is 1.78 times higher than the national average.

The IT industry pan India faced adversities due to covid. In Telangana, the IT industry was able to retain its momentum with a strategic outlook. According to Telangana IT, E&C Department Annual Report 2021, Telangana's IT/ ITES Exports stood at 1,45,522 crores for the financial year 2020-21 with an increase of 12.98% over the previous financial year. This growth is remarkable considering the economic slowdown caused due to pandemic. During the same period, Telangana added 46,489 new jobs taking the total IT/ ITES employment to 6,28,615 with a YoY increase of 7.99% compared to the FY 2019-20. Telangana recorded a Compound Annual Growth Rate (CAGR) of 14.25 per cent in IT-ITES exports since 2013-14. Even by conservative estimates, Telangana's IT/ ITES Exports growth rate is poised to be over two times that of the national average.

The share of Telangana's economy in national GDP went up by 26 basis points to 5.0 per cent in 2020-21 against 4.74 per cent in 2019-20. Despite the pandemic induced slowdown, the state could attract investments from companies such as AWS, MassMutual, GoldmanSachs and NPCI, said the honourable IT minister K.T. Rama Rao in one of his interviews.

Despite the COVID pandemic, the Telangana govt had a focused policy to induce the IT sector in Tier-2 cities and rural areas. IT Towers at Warangal, Khammam, and Karimnagar, with an aggregate seating capacity of 2,500 seats, became operational in 2020-21, while construction of IT towers in Nizamabad and Mahbubnagar is nearing completion.

Initiatives like T-Hub and We Hub by govt of Telangana buttressed the entrepreneurial ecosystem throughout the pandemic. WE Hub is India's first state-led incubator for women entrepreneurs with a primary goal to promote and foster women's entrepreneurship by way of incubation, access to Government, and building a collaborative ecosystem.

During the pandemic, WE Hub organised sessions on business continuity, created linkages with QMart, MEESHO, Flipkart and Metro and assisted 36 entrepreneurs through the four channels and assisted 13 enterprises with collateral-free credit through our credit linkage drive amounting to ₹ 12.01 crores. It also engaged two service providers: H Works and GrowthMeets and assisted 30 entrepreneurs with branding and packaging. On WE Hub's third anniversary, the ministry also launched The Pink Book, which served as a guide for women entrepreneurs looking to establish their startups and enterprises in the Telangana state. The book was created to make necessary information and mechanisms accessible to budding women entrepreneurs.

In 2020, T-Hub completed five years of enabling and empowering the innovation ecosystem and creating an impact for startups, corporations, and other stakeholders. In these five years, T-Hub has transitioned from being just an incubator to an innovation ecosystem enabler. During the pandemic, T-Hub worked towards developing programs and strategies for startups to deal with the ongoing crisis and for the new normal. It did so with the help of webinars and mentor connects ranging on various issues ranging from personal safety, emerging practices for handling COVID, business management practices like planning, target-setting, and project management.

At a national level, several policy measures were undertaken to curb the impact of the pandemic. The central government announced stimulus and relief packages of around 10% of the GDP, partial unlocks in COVID free- zones, and re-opening of essential activities and businesses across the country. The economic survey 2021 forecasted a V-shaped recovery across all key economic indicators vis-à-vis the 23.9% GDP contraction in Q1 in 2021.

HYDERABAD AS INDIA'S IT CAPITAL – A NEW VISION

Hyderabad's journey from a historical city known for its Educational institutions, its Public Sector Units and its unique culture to a technological hub and a major software centre is indeed remarkable. In the last fifty years, this gradual transformation has also made the city a favorite destination for the Pharmaceutical and the Financial sectors. At the same time, it also became India's busiest film making hub after Mumbai with some of the most advanced film studios creating some of the biggest cinema in Indian history.

This journey is yet unraveling in the youngest state in India, already ahead of most others in governance, political stability and infrastructure growth. Telangana indeed is on the path to becoming the driver of futuristic economic growth in the region it takes a leap forward with the entry of some major international players in new sectors such as Bio Pharma, Artificial Intelligence and E Commerce. This continuous growth in business activity is predated upon a stable administrative set up that provides the necessary conditions for the private sector to flourish.

The way ahead therefore will mean that the following enabling institutions and environments that have been carefully nurtured in the state are developed further and made more robust.

a. Sustaining a crime free environment in the state

b. Maintaining law and order in guaranteeing safety to all

c. Speedy systems of clearance and transparency in bureaucratic decision making

d. Specialized ministries that look after all factors of production and ensure the best quality workforce

e. Educational institutions that produce world class skills and capabilities

f. A health system that guarantees Universal Health care, is ready for emergencies and can tackle sudden outbreaks of disease

g. Women workers are guaranteed safety on roads and in public transport and can freely move around for work and for recreation

h. Foreign and Domestic investment is given a peaceful environment to build capacity in and where a diverse workforce can thrive

i. Disparities are reduced between urban and rural areas with respect to access to health, education and infrastructure

j. Public utilities are provided round the clock and with no uncertainty of supply or quality.

k. Public offices are accessible, proactive and responsible. Accountability is fixed and bureaucratic initiative is encouraged

Telangana, therefore will continue to be a model state for the rest of the country and the region in being able to provide an environment of safety and innovation where start ups, innovation centres and new ideas germinate and reach their potential. Towards this, just like in the past, it is important for the executive to be alert to new challenges that emerge and to exploit the opportunities that come by with changes in world trade, geo politics and the pace of technological evolution. The core will however remain an agile civil service that will enable public private partnerships, provide ameneties that make up a modern state and is accountable for everything that it takes up.

CHIEF PATRON

SRI HARPREET SINGH, IAS

Director General (FAC) & Spl. Chief Secretary to Govt.

He served as Principal Secretary to the common Governor of Andhra Pradesh and Telangana, from 1st April 2016 till 14th March 2019. Shri Harpreet Singh has been serving Dr. MCRHRDIT as Additional Director General (Training) since 15th March 2019. He assumed charge of Director General (FAC) of Dr. MCRHRDIT on 2nd November 2020.

ADVISORY COUNCIL

DR. GAUTAM PINGLE

Head & Dean of Studies, Centre for Telangana Studies, MCRHRDIT

He studied and obtained his BSc. (Econ) (Hons) from University College, London and the PhD from Glasgow University, Scotland. His thesis was on Telangana. He worked as Research Associate at Glasgow University and then joined the Commonwealth Secretariat, London. On his return to India, he worked at the Centre for Policy Research, New Delhi. He was Dean of Research and Consultancy for two terms. He retired in November 2012. Since March 2017 he has been Head of the Center for Telangana Studies and Dean of Studies at MCR HRD Institute of Telangana.

DR. MOHAMMED ABBAS ALI

Head & Sr. Professor, Centre for Management Development Centre, MCRHRDIT

He was Hon. Advisor, Confederation of Indian Industry (Andhra Pradesh), National Convener for Assistance Program in India, Islamic Development Bank, Jeddah, Kingdom of Saudi Arabia, etc. He worked as Consultant in AP Minorities Commission and formulated a number of schemes for Minorities. He was a member of the Combined Research Advisory Committee, Ministry of Social Justice and Empowerment and National Committee for Social & Economic Welfare, Ministry of Finance.

PROF. AMIR ULLAH KHAN

Professor at the MCRHRDI of the Government of Telangana

He is also a former Civil Servant from the batch of 1993. He has worked on various research projects for the European Commission, National Council for Applied Economic Research, Planning Commission, Confederation of Indian Industry and the World Bank. During this millennium, he has worked with the AEquitas Consulting, India Development Foundation, PHDCCI, Bangalore Management Academy, and the Bill and Melinda Gates Foundation.

SRIDEVI AYALURI

Director (IT & e-Learning) & Head, Centre for Information Technology, MCRHRDIT

She has over 22 years of experience in the areas of e-Governance, ICT initiatives in Government., She has done "Executive Programme in Business Management (EPBM)" from IIM Calcutta, M.Sc Computer Science from Kurukshetra University and M.A in Sociology from Osmania University. Currently working as Director (IT & e-Learning) and Centre Head for Centre for Information Technology (CIT) at this Institute. She is a Life Member of the Computer Society of India (CSI) and an Executive Member of the CSI Special Interest Group in e-Governance.

DIVYA PARMAR

Divya Parmar, IES is an officer of the Indian Economic Service, 2003 batch. She holds a bachelor's degree in economics from the Lady Shriram College for Women, Delhi, and has done her Masters in Economics from the university of Allahabad.

A native of Uttar Pradesh, she moved out of her hometown in 2003, thereafter serving in her service in many posts, including as Assistant and Deputy Director, Niti Ayog, Assistant Director, Ministry of Industries, Delhi. She moved to Hyderabad in the year 2006 and worked in the regional office of the Planning Commission till Sep'2017. She has been posted in the Telangana State Planning Department since 2017. In 2018, she has joined the MCRHRDIT, working in the capacity of Director, CSDGs, and Director, Administration.

Her areas of specialisation include Demography, Population Studies, Micro and Macroeconomics and Gender Studies. She has written a book on Public Finance, and done a short term thesis on Migration. Currently, she has been conducting Foundation Courses for all India Service Officers, as well as programs on the Sustainable Development Goals.

ACADEMIC COUNCIL

DEBASHIS CHAKRABORTY

Debashis Chakraborty teaches Economics at the Indian Institute of Foreign Trade (IIFT). He has twelve authored or edited volumes, including, "India's Trade Analytics: Patterns and Opportunities" (Co-Edited: Sage, 2019) and "Trade, Investment and Economic Development in Asia: Empirical and Policy Issues" (Co-Edited: Routledge, 2016). For the last six years, he is Editorial Board member of Foreign Trade Review (Sage). He received his PhD degree from Jawaharlal Nehru University (JNU), New Delhi.

KAUSHIKI SANYAL

Dr. Kaushiki Sanyal is the CEO and Co-Founder of Sunay Policy Advisory Pvt. Ltd., a public policy research and training consultancy. Her previous experiences include stints at NDTV, PRS Legislative Research, the Bharti Institute of Public Policy at the Indian School of Business, the World Bank, Vidhi Centre for Legal Policy and the Rajiv Gandhi Foundation.

She co-authored two books with the Oxford University Press – Oxford India Short Introductions: Public Policy in India (2017) and Shaping Policy in India: Alliance, Advocacy, Activism (2018) in addition to authoring many book chapters, journal articles and newspaper columns. She has a PhD in International Relations and a Masters in Political Science from Jawaharlal Nehru University, New Delhi.

TCA SRINIVASA RAGHAVAN

He has been an economic and political analyst since 1980 for several newspapers; experience in academic research and the history of central banks. Has written two books and published extensively in newspapers and journals.

His Professional Experience is as follows:

- Economics Editor, Macmillan India (1975-80)
- Assistant Editor, Eastern Economist (1980-82)
- Assistant Editor, Financial Express (1982-85)
- Economics Editor, Indian Express (1985-89)
- Associate Editor, Economic Times (1989-94). Editorial page editor
- Associate Editor, Business Standard (1994-97). Editorial page editor
- Associate Editor, Hindu Business Line (2008-13)
- General Editor, RBI History, Volume 3; & Consultant to RBI History, Volume 4
- Editor, Margin, National Council of Applied Economic Research (2003-06)

RESHMI SENGUPTA

She is an Associate Professor of Economics at FLAME University, Pune. She completed her PhD in Economics from Northern Illinois University (NIU), USA. Dr. Sengupta's primary research interest lies in the field of applied health and development economics. She has research publications in reputed journals, like World Development.

She has also presented her research papers in several national and international conferences of repute. She has worked as a consultant in the evaluation of the status of Muslim education in India in the Post-Sachar Evaluation Committee Report (Kundu Committee), Government of India.

THARUVAI SRINIVASAN

Prof. T.S. Srinivasan has more than 30 years of experience in management education and training, including industrial experience of over 12 years (Director, Oberoi School of Hotel Management, Delhi, and Senior Faculty Member, Management Training Institute, Steel Authority of India, Ranchi). He has been a Visiting Professor, for several years, in the IIM System - Lucknow, Kashipur, Ranchi, Sirmaur and Trichy. He also has experience teaching in the former Soviet Union during that region's painful transition from a command economy to a market-based economy. His prior assignments were:

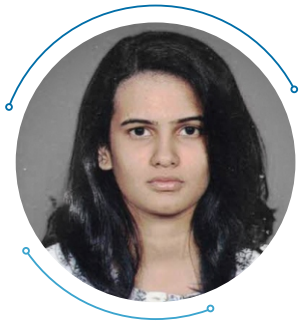
- Professor, International Management Institute, Delhi (12 years, including one academic year at the IMI, Kiev, Ukraine)
- Director, Oberoi School of Hotel Management, Oberoi Hotels, Delhi (4 years)
- Senior Faculty Member, Management Training Institute
- SAIL, Ranchi (8 years)
- Assistant Professor, XLRI, Jamshedpur (4 years)
- Served on the faculty of the Advanced Management Programme, India's most prestigious top management programme, conducted in Srinagar, by the All-India Management Association (1988 and 1989)

RESEARCH TEAM

SRIRAM BHUPATHIRAJU

Sriram is a Research Analyst at CRIDP. He is an anthropologist with an MPhil (IIT Hyderabad), MA (University of Hyderabad), MBA, BBM and a Certificate holder in 'International Management and Law' from the University of The Hauge, Netherlands. He has worked in the IT industry for over a decade before venturing back into academia. His MPhil thesis is titled "Burnout: An Ethnographic Study of Occupational Stress among Mid-Career IT Professionals in Hyderabad, India".

ANJANA DIVAKAR



Anjana is a Research Associate at CDPP with a Master's in Public Policy from Jindal School of Government and Public Policy. She is the Managing Editor of the Journal of Development Policy and Practice (JDPP) and has previously worked with organisations like E&H Foundation, Sanket Development group and Foundation for Democratic Reforms. Her research areas include public policy concerns such as quality of education, agriculture, philanthropy and citizen engagement in local governance.

MADHAV MALHOTRA

Madhav is a Research Associate at CDPP. He has done his bachelor's degree in Business Economics from the University of Delhi. He was also a student at the Institute and Faculty of Actuaries, UK. His areas of interest are development economics and public policy.

SYED SALMAN UDDIN

Syed Salman Uddin is Manager (Operations & Finance) at CDPP. He has a degree in mechanical engineering from JNTU.

INTERNS

DIVYA ARCHANA DEVULAPALLI

Pursuing Integrated Masters of Arts (IMA) Economics (2016-2021) from the University of Hyderabad.

PEDDI HARSHITHA

Completed bachelor's degree at G. Narayanamma institute of technology and science (2016-2020) from JNTU-H

POOJA RANI

Pursuing Integrated Masters programme in Economics at University of Hyderabad 2016-21

SAMIA FARHEEN

She is a Triple major graduate in Psychology, Economics and Sociology from Mount Carmel College, Bangalore. Her areas of interest include geo-politics and international relations.

AKSHITA PENMETSA

Akshita Penmetsa is a research intern at CDPP. She is pursuing her Bachelor's in Business Administration from Osmania University. Her interests lie in the fields of data analytics, research, and development.

CONTRIBUTORS TO THE PROJECT

RAJAT AGGARWAL

Rajat Aggarwal is the Founder & CEO at DreamVu and received his BS and MS from IIIT Hyderabad in 2017 with a specialisation in computer vision and computational photography. His path-breaking research on computational cameras led to several publications and patents starting from his early undergraduate days. His publication in CVPR'16 was a breakthrough in the field of computational photography and eventually became the seed for DreamVu.

Rajat is now driving the market adoption of omnidirectional stereo cameras through novel inventions in the optics at DreamVu. He also worked with prestigious research groups like MIT Media Lab's Camera Culture group inventing low-cost medical devices. A hardcore inventor at heart, Rajat is a true believer in the power of optics to solve some of the trickiest challenges in sensing and perception for humans and machines.

NARENDRA AHUJA

Narendra Ahuja is a Research Professor in CSL and ECE at the University of Illinois Urbana-Champaign where he was Donald Biggar Willet Professor till 2012.

During 2013-19, he was the Founding Director, Information Technology Research Academy, a Government of India initiative involving 76 research groups, 62 institutions, 143 Faculty and 167 PhD students, aimed at large scale digital transformation, resulting in 20 prototype IT solutions to societal problems. During 1999-2002, he was the Founding Director of the first IIIT, International Institute of Information Technology, Hyderabad. He has co-authored 3 books, over 400 papers and 4 patents. He has supervised over 50 PhD, 15 MS and 100 Undergrad students and over 10 Postdocs. His texture models were incorporated in GE's flight simulators and CMC Ltd's fingerprint system. His automated railway inspection methods were used in commercial products. His body-neck-eyes move-orient-verge-focus-zoom stereo camera prototype was a precursor to commercial products. His spatial occupancy algorithms were used by Honeywell. His awards include: IEEE Emanuel Piore award, SPIE Technology Achievement award, IME's Stewart-Dyer/Frederick-Harvey-Trevithick Prize, University of Maryland's Alumni Hall of Fame, several Best Paper Awards; Distinguished Alumnus Awards from University of Maryland, BITS Pilani and Indian Institute of Science, Bangalore; and an Honorary Doctorate from York University, England.

ROHAN BHATIAL

Rohan is currently working as the Co-founder & VP of Sales for DreamVu. He is a serial entrepreneur with a proven track record of setting up and scaling innovative businesses globally.

He leverages a strong background in technology and marketing to identify unique market opportunities for pre-product-market fit stage companies. He has an excellent track record of generating and converting leads into revenues.

SHEELA BHIDE

Dr. Sheela Bhide is a retired Civil Servant belonging to the Indian Administrative Service, Andhra Pradesh Cadre of 1973 Batch. She has served the Government of Andhra Pradesh and Government of India in various assignments over a period of 36 years.

In Government of India, she has held the posts of Chairperson of the India Trade Promotion Organization under the Ministry of Commerce and Industry, Special Secretary and Financial Adviser in the Ministry of External Affairs, Additional Secretary and Financial Adviser in the Ministry of Defence and Joint Secretary in the Ministry of Corporate Affairs.

In the Government of Andhra Pradesh, she was Principal Secretary in the Department of Industries and Commerce and Principal Secretary in the Department of Finance, besides several other posts held by her both in the field and in the Secretariat.

At present she is the Chairperson of the Women Entrepreneurs International Trade and Technology Centre, Senior Adviser to the Indian Institute of Foundrymen, Senior Adviser to the Association of Lady Entrepreneurs of India, Independent Director on the Boards of Rane Holdings Ltd., Gati-Kintetsu Private Ltd., Ahluwalia Contracts India Ltd. and Suryoday Foundation.

C. V. S. N. MURTHY

CVSN Murthy is a veteran in the IT industry who has seen IT Transformation from 1970's to 2020's, from Mainframe/Minicomputers to Smart IoT, Embedded and AI Systems. Murthy holds a degree in Electrical and Electronics Engineering and a Masters in Neural Networks.

Starting his career with Administrative Staff College of India, he founded ACS Technologies Ltd with other technocrats in 1980 and grew to MD role and is currently an Independent Director. Murthy contributed extensively to the growth and Digital Transformation of ACS during his tenure of over 30 years. He has also served in CxO/Director roles in leading IT companies.

He has played a key role in providing various mission critical solutions for Government, Defence, PSUs and Large Corporates. As a member of CSI and many IT forums, Murthy has served the IT industry as a technocrat, leader and a mentor at various career stages and is an innovator and techie at heart.

SRINIVAS CHILAKALAPUDI

He is currently the Chief Strategy Officer at Green Gold Animation Pvt. Ltd.

Armed with a M.S degree in Computer Science from University of Missouri as Kansas City, Srinivas has over 25 years of experience in management roles at various technology companies. After a three-year stint in the US, Srinivas moved back to India during the time mobile & internet were taking off in the country. He was instrumental in setting up and building offshore R&D centres for companies that he has been a part of.

He worked with Advanced Computer Communications as the Head of R&D which was later acquired by Ericsson. He also had extensive stints with ActivIdentity (which went public on NASDAQ), Agami Systems and Ocarina systems (acquired by Dell).

Srinivas' association with Green Gold Animation has been since inception in an advisory role and he joined the company full time in November 2011, leading the strategy as a part of the three-member management team.

RAJU DANDU

Raju S. Dandu is a founder director and CEO of Danlaw Technologies India Ltd. as well as that of Danlaw Incorporated, USA

Raju started his professional career in 1977 as a programmer analyst with University of Iowa hospitals where he was responsible for systems programming for the cancer institute. He moved on to Dearborn, Michigan in 1978 to work for Ford Motor Company as software engineer where he developed controls based on 16-biton first 16-bit microprocessors as well as the first automated engine control software tester. He moved to Dana Corporation in 1980 where he was responsible for development of general-purpose CNC and developed the first ever GUI and application logic on CNC control. Raju worked as an independent consultant for General Motors from 1982 to 1984 responsible for Engine control and Body computer modules. He then founded the Danlaw Inc. in 1984, which is today synonymous with vehicle diagnostics, testing and messaging and is a tier-1 vendor to GM.

Raju did his bachelors in electrical engineering from Kakinada, India, his masters in electronics from Iowa State University and his MBA from Detroit University. He is a member of IEEE, Society of Automotive Engineers and the Society of Manufacturing Engineers.

ASHHAR FARHAN

Farhan is a serial entrepreneur, technologist and an angel investor. In 1986, he joined Integrated Data Systems as a part-time design engineer while still a student and built a paged memory system for the BBC micro and then a Point of Sales terminal based on it. In 1987, wrote the first antivirus for the Brain Virus that was infecting floppy boot discs. In 1989, started Computer Corporation and wrote an Urdu Composing System to address the problems of Urdu Publishing.

He is the co-founder of The Indus Entrepreneurs (TiE) Hyderabad chapter and started Phonestack technologies to productise the emerging VoIP technologies and provide call metering, switching, routing and business services to VoIP operators. In 2010, established Lamakaan, the open cultural centre that has been the central place for start-ups, arts and cultural activities in Hyderabad. It is listed among the top 10 places to visit in Hyderabad by Conde Nast, NatGeo, etc. Lamakaan has also hosted the Start-up Saturdays for the last five years.

In 2015, co-founded the Daana Network to bring the produce of the small organic farmers directly to the end consumers, helping to reduce their financial distress.

ASHISH GUPTA

With more than 35 years of journalistic experience in national and international newspapers and magazines. Ashish Gupta has written extensively on the state of Indian infrastructure, chronicled India's journey in implementing economic reforms, dissected various central Budgets and monetary policies of the Reserve Bank of India, took stock the gyrations of the stock markets and watched with awe the rise and rise of new- age technologies. He also brings with him a wealth of experience in analysing corporate strategies, tracking the success and failures of many of India Inc's biggest names.

Starting his career with The Times of India, Delhi, he has worked with the Indian Express, The Statesman, Business Today, Outlook Business and Fortune India. He recently retired as Deputy Editor and Chief of Bureau, Fortune, Delhi, the Indian edition of the US Fortune magazine.

CHANDRASHEKAR RAO INAGANTI

Chandrashekar Rao Inaganti started his professional career in 1987. He is a versatile and results-focused senior multidisciplinary executive with 32 years of experience.

He is the Managing Director and CEO at Indian Farmwood Products Ltd. He is also the head and board member at various technology companies.

In the start-up spaces he is the CSO (Chief Strategy Officer) for Spearheading Incubation Investments in Companies in Automation Systems, UAV Accessories Manufacture. Currently he is invested in four Indian Companies.

He has multi-disciplinary expertise in International Business Development, IR Compliant Implementations, Information Technology Systems, Project Management, Finance, Mergers & Acquisitions, Construction & allied Areas.

J. A. CHOWDARY

J.A. Chowdary is an entrepreneur, technology leader and innovator with an illustrious career spanning across private and public sectors. He is passionate about improving the lives of Indian youth through technology education and employment opportunities. Over the last 25 years, JA Chowdary has helped grow the Indian IT industry in the capacity of an IT advisor and Policy advocate for several Indian state governments, head of several Indian and global Industry forums such as FICCI, AMCHAM, TIE, HYSEA, IEEE, ISCC, Chairman of STPI, Hyderabad, Chennai and Bangalore. Founder and India managing director of global technology companies, board member of leading companies, advisor to Universities and Technology institutions.

Presently he is the Chairman of Blockchain committee at Bureau of Indian Standards, Government of India. Where he is spearheading the formulation of Indian Standards for Blockchain Technology which will become part of ISO standards for Blockchain International Standards. He is also the Co-founder of Fintech Forums in India at Hyderabad, Bangalore & Chennai with members from Government, Investment community, Education & Research community, Financial Institutes and Technology companies to encourage fintech start-ups and adoption.

RAMESH LOGANATHAN

After 25 years in the product R&D space, moved to IIIT Hyderabad as faculty in 2016. As Professor Co-Innovation, heading the Research / Innovation outreach at IIIT Hyderabad. He helped start and grow the Technology Transfer Office, Co-Innovation (corp) labs, and the Centre for Innovation & Entrepreneurship. Association with IIITH started in 2002 as Adjunct faculty. He also was a visiting faculty at IIT Hyderabad (Innovation), and a member of governing board of incubators at IIIT-H, IIT Hyderabad, IIIT-Delhi and BITS.

Prior to academics worked in the tech industry bay area and since 2000 in Hyderabad, as product R&D leader. Most recently was the India Head for Progress Software. Prior to Progress, was VP of Middleware Technologies at Pramati, and also headed Product Engineering. He was the Interim Chief Innovation Officer of Telangana state in 2017 and One of the Founders of Headstart Network (StartupSaturday). Also Chaired ACM Hyderabad Chapter 2012-14. Active in industry organisations. most recently was President of HYSEA (Hyderabad Software Industry Association) and regional council member at NASSCOM. Also on several committees and panels of state and central government including Meity (Govt. of India) panel on innovation, BIRAC ACE fund of funds committee and state Blockchain District.

OSAMA MANZAR

Osama Manzar is a global leader on the mission of eradicating information poverty from India and the global south using digital tools through an organisation he co-founded in 2002 - Digital Empowerment Foundation.

With over 25 years of experience, Osama has worked in the areas of journalism, new media, software enterprise before he established DEF to digitally empower the masses (so far 20 million directly) with a footprint of 1000 locations and 9000+ digital foot soldiers across 130 districts in 24 States. Osama Manzar was instrumental in making the National Digital Literacy Mission for DEF and its co-creators which later got adopted by the Indian government. He also was a part of the team that developed India's one of the biggest schemes called Common Service Centers. Recently, in 2020 the government of India declared PM-WANI to decentralise and democratise last mile wifi based on DEF' Wireless for Community program conceived by Osama.

He served as a Member of Advisory Board at Alliance for Affordable Internet (A4AI) and a Member of the Board at APC (Association of Progressive Communication). He is a member of Media & Information Literacy Experts Network (MILEN) and a at Member at Global Network Initiative (GNI); Board of World Summit Award (WSA); Ibtada; Society for Labour & Development (SLD); Down To Earth; Missing; Swaraj University, Proto Village and Protsahan Sanstha.

ANANT MARINGANTI

Anant Maringanti is the director of Hyderabad Urban Lab, a multi-disciplinary urban research centre based in Hyderabad.

He is a geographer with a PhD from University of Minnesota. He has taught graduate courses at the National University of Singapore and University of Hyderabad. His research and teaching interests centre on questions of urbanisation and globalisation from the South Asian vantage point. He is widely published in national and international academic journals on social movements, politics of development and urbanisation.

RADHAKRISHNA M.

After getting training as an Apprentice Programmer at IIT Madras he started his career at ASCI in 1976. As a seasoned Information Technology (IT) executive with 45+ years of proven expertise in management of IT establishments as a Director, Chief Architect and Chief Operating Officer, Chief Executive Officer, with profit & loss responsibility, software development and delivery, client relationship management, strategy formulation, leadership and dual shore execution of projects.

He went on to establish a 100% subsidiary, Arsin Systems Pvt. Ltd. in India and achieved productivity and profitability gains of above 45%. As Director of International Operations, established a world class offshore development facility for the India Development Center (IDC) including the network and the other infrastructure. Responsible for recruitment of all key people, profit and loss, delivery of all the projects executed at IDC, budget forecasting, and government and legal communications. Established collaboration process and procedures for conflict resolution and issue management across multiple teams at multiple locations. Worked with HR on employee hiring, training, mentoring and compensation policies to minimise the attrition rate. His experience has enabled him to understand those groups' needs, creating a unified plan for satisfying those needs, and juggling priorities to ensure the plan is executed properly. Radhakrishna, having been an entrepreneur from the age of 27 years, always thinks of innovative means of achieving what is good for both employees and the organisation.

INDER SEN NANDIGAMA

Inder is the co-founder of Applied Syntax, a technology firm helping enterprises and startups alike with their technology needs. Inder has over 13 years of varied experience in technology ranging from designing emergency systems for governments to building consumer products from scratch.

At Applied Syntax, Inder helps businesses identify the apt technology tools and solutions and then build them to enhance their core business value propositions. His experience in building web and mobile products as well as building startups uniquely places him in the intersection of technology and business which he leverages for his clients in travel, retail, finance and medical industries.

Prior to Applied Syntax, he had started 2 product startups building a computer game and a cloud-based Fleet Management Software for which he had raised investments. Before jumping on to the entrepreneur bandwagon, Inder as an IT Consultant worked with clients such as Ericsson and Nissan in India and Europe.

CHAITANYA PEDDI

Chaitanya Peddi, is the Co-Founder & Product Head at Darwinbox. A true subject matter expert of both HR and Technology, heads product & engineering at Darwinbox. Prior to Darwinbox Chaitanya worked as an HR consultant with Ernst & Young and consulted global firms on organisation design and performance management. Having worked in product development at Verizon and combined with his consulting experience, Chaitanya commands a rare vantage point in the HR tech space. An immense experience of around 11 years in the field of consultancy and product development has empowered him to understand the specific needs of the HR Tech market and build a world-class product. These products not only optimally automate and simplify HR processes for enterprises but also enables HR to be a game-changing strategic function. He holds a B.Tech degree in electrical and electronics from JNTU College of Engineering, Hyderabad and has done PGDM (MBA) in Human Resources and Strategy from XLRI.

SRINI RAJU

Srini Raju founded iLabs Group in 2000. iLabs Group is one of the pioneers of the Investment Ecosystem in India. Over the years, it has grown its scope in terms of both Investment and Industry. Originally started as an Angel Investor, iLabs Capital has expanded into Seed-Stage, Early-Stage and Growth-Stage Investments, as well as Re-Structures and Buy-Outs. Initially focused on Technology & Technology enabled Ventures, iLabs Capital has extended into Consumer Products & Services; Health Care; Skills-Development; Media and Entertainment; Corporate and Industrial Parks. Today, iLabs Group is one of the front-runners of the investment landscape in India.

Srini has an MS in Civil & Environmental Engineering from Utah State University, USA and a BS in Civil Engineering with Honors from REC (NIT), Kurukshetra. Srini has over 35 years of experience in Information Technology, Venture Capital and Private Equity. Prior to iLabs Group, Srini was Founding CEO & MD of Dun & Bradstreet Satyam Software (later became Cognizant Technology Solutions) and Satyam Enterprise Solutions. He is passionate about Education and Skills Development. He is a Founding-Member & Member of Governing Council of International Institute of Information Technology (IIIT), Hyderabad; Industry Partner (Donor) & Member of Board of Governors of Indian Institute of Information Technology, Sri City; Executive Board Member of Indian School of Business (ISB) and Benefactor of Srini Raju Center for Networked Economy (SRITNE); Co-Sponsor (Donor) and Board Member of KREA University; and Founding-Member & Board Member of T-Hub, Hyderabad.

RAO TUMMALAPALLI

He is the Co-Founder and Managing Director of Seneca Global. Rao Tummalapalli drives the strategic direction of SenecaGlobal and manages the company's operations in Hyderabad, India. Under his leadership, SenecaGlobal has achieved the highest levels of client satisfaction and built a people-first culture where team members are encouraged to innovate.

Mr. Tummalapalli was one of the first entrepreneurs to create an outsourced product development model based in India, which provides technology services globally. He previously served as managing director and co-founder at divine India and Alliance Global Services India (currently EPAM India).

He is an active volunteer with the Dakshana Foundation, a philanthropic organisation aimed at alleviating poverty throughout the world.

He earned a bachelor's degree in Civil Engineering from Jawaharlal Nehru Technological University in Kakinada, India, and a master's degrees in Computer Science and Civil (Structural) Engineering from West Virginia University in Morgantown, West Virginia, USA.

ANURADHA REDDY

Anuradha Reddy is the convenor of the Indian National Trust for Arts and Cultural Heritage (INTACH), Hyderabad chapter. She has been a history enthusiast since her childhood. For more than five decades, she has been travelling extensively and actively exploring heritage sites within and outside India.

In 1984, she joined INTACH after it was formed at the India level, Hyderabad was the second chapter to open in the country. She is also the former president of another group called SPEQL (Society for Preservation of Environment and Quality of Life), which works with natural and built heritage and environmental protection.

B.V.R. REDDY

Dr. BVR Mohan Reddy is Founder Chairman-Cyient, it was established in 1991. His efforts led Cyient to contribute more than $5 billion in cumulative exports from India to several global clients, including many Fortune 100 companies across 14 countries.

Dr. Reddy served as the Chairman of NASSCOM during 2015-16 and is a member of its Executive Council since 2003. He served as the Chairman of CII, Southern Region (2008-2009), and is currently the Chairman of its National Education Council. Dr. Reddy is also the Founding Director of T-Hub, the largest start-up incubation center in India.

He is currently the Chairman of the Board of Governors of IIT-Hyderabad, IIT-Roorkee, member of the Leadership Advisory Board at the University of Michigan College of Engineering, USA, and a member of the Board of Administrative Staff College of India.

Dr. Reddy received India's fourth-highest civilian award the Padma Shri in 2017 for his contribution to trade and industry. He is the recipient of numerous awards recognizing his industry leadership, corporate excellence, and institution building.

He holds postgraduate degrees from IIT-Kanpur, and University of Michigan, USA. He is also the recipient of four honorary doctorates.

R. CHANDRASEKHAR

R. Chandrashekhar is Chairman, Centre for The Digital Future, Gurugram. He is associated with several domestic and international technology-centric organisations in advisory roles and Board positions. As a former Secretary to the Government of India for Electronics, IT and Telecom and President, NASSCOM he possesses a unique breadth of expertise and experience, both in the Government and private sector, that covers the entire gamut of the IT and Telecom sectors.

He was a member of the country's premier Indian Administrative Service from 1975 to 2013. During the period 1996 to 2001, he was the Chairman & MD, APIIC and concurrently Secretary, IT of AP. During that period, he spearheaded all the IT initiatives in the state including establishing HITEC City and IIIT and the e-Governance program. He retired from Government service in 2013 with an impeccable record studded with many accomplishments in the field of IT, Electronics and Telecom.

SUNIL RUDRARAJU

Sunil Rudraraju is the CEO at Voxai Solutions Inc. He started Voxai Solutions in 2005 with a select group of consultants focused on building applications and providing services that improved the customer experience. By building long-term partnerships with customers and delivering tangible value, Voxai has grown to over 180 employees in the last sixteen years, and its customer list includes many Fortune 500 companies.

Previously worked with Adea Solutions Inc, Pragyaa Consulting LLC, American Airlines. Sunil earned Master's degree in Computer Science from University of North Texas and Bachelors, Civil Engineering from Birla Institute of Technology and Science, Pilani.

RAMANATHAN S.

Ramanathan started his career as a Programmer in 1983 and has traversed the multiple versions and upgrades of the Indian IT industry. His areas of work range from managing outsourcing relationships, setting up and managing global product development centres, venture incubators, high end technology parks, working with start-ups, people and organisation development. He has been associated with the Vanenburg Group of Netherlands since 1987 and has held senior management positions in its subsidiaries like Baan, Cordys and Vanenburg IT Parks in India. He is currently advisor to Vanenburg Software of Netherlands.

As Director of Baan India, he has led teams of over 800 people developing, supporting, maintaining and implementing ERP software for global markets As CEO of Vanenburg IT Park he led the efforts to create one of the first and largest private IT parks in Hyderabad with a capacity of over 10000 people and subsequently implemented its exit strategy successfully.

He was Vice President and Executive Committee Member of Hyderabad Software Enterprises Association (HYSEA) and has been active in its Software Products Forum for over 20 years. He is also the Founder President of the Project Management Institute-Hyderabad Chapter.

He holds a Bachelor’s Degree in Physics from Mumbai University and has been certified in Production and Inventory Management (CPIM) and Integrated Resource Management (CIRM) by APICS, the Association for Operations Management.

ASHIS SANYAL

Ashis Sanyal is former senior director of the department of electronics & IT (DeitY).

Presently he is an independent consultant who provides his management consulting services in the areas of Electronic Governance, Communication Network and ICT for Community Development. During his time as a bureaucrat he worked on citizen-centric e-Governance strategy & policy formulation with a specific emphasis on Rural Service Delivery, Strategy and Program Implementation at the National Level under the ambit of National e-Governance Plan (NeGP) of Government of India with an aim to enhancing equitable and inclusive growth addressing the national development objectives of poverty reduction and building a knowledge-driven society.

SIVARAMAKICHENANE SOMASEGAR

Soma Somasegar is a Managing Director at Madrona Venture Group, joining Madrona in 2015 after nearly twenty-seven-years at Microsoft where he most recently was Corporate Vice President of the Developer Division. Additionally, Soma was the executive sponsor for global development at Microsoft and oversaw Microsoft's Global Development Centers in China, India, and Israel. Soma has been an active angel investor both in the region and globally. With investments spanning across both enterprise and consumer segments, Soma has focused on early-stage investments across a wide range of technology areas. At Madrona, he is focusing on machine learning / artificial intelligence, intelligent applications, developer centric next-generation cloud platforms and tools, and multi-sense user interfaces.

Soma holds a master's degree in computer engineering from Louisiana State University and a B.S. in electronics and communication engineering from Guindy Engineering College, Anna University in Chennai, India. Soma also has an Honorary Doctorate from his alma mater, Anna University.

RANDEEP SUDAN

Randeep Sudan currently is the Practice Manager for Information and Communication Technologies at the World Bank, based in Washington DC. In his role, he and his team support developing countries on policies and programs relating to broadband infrastructure, mobile networks, digital services, and ICT industry development.

Prior to joining the World Bank, he worked in India as a member of the Indian Administrative Service - IAS. He was a key member of the leadership team that helped the state of Andhra Pradesh in India, to make significant progress in e-government, and become an important international destination for IT-based services. He has a Master's degree from the London School of Economics.

SANTOSH SURABI

Santosh is the Co-Founder & Director at Applied Syntax Private Limited.

Santosh has over 18+ years of experience building software companies and has a passion for creating elegant & scalable software solutions for complex problems. His main area of expertise is AI/ML, Computer Vision, Enterprise Commerce, eCommerce, and solving complex workflows using the software. His greatest ability has been to drive innovation from the idea stage through to implementation.

Has also Co-Founded an EdTech start-up Yomplex (Delta Cards Education LLP.,), which helps students to understand math concepts thoroughly using short topic-wise tests and track weekly progress to give an accurate assessment of preparation and guides the students progress. He is quite keen to work with Industry to automate & solve complex problems using Computer vision & Machine learning.

ARJUN VALLURI

Arjun is the Chairman and Managing Director of Blaze Automation and leads the vision and ideation efforts. As a successful serial entrepreneur Arjun has received various awards for his business accomplishments and has made significant investments in the Green Energy and Technology sectors.

He was the Co-Founder, Chairman, President and Chief Executive Officer of Intelligroup, Inc (acquired by NTT Data). Throughout the years, Arjun has received multiple NJ Fast 50 awards, Var Business 500 Awards, NJ Entrepreneur of the Year awards, and the NJ Ernst & Young Entrepreneur of the Year in 2001.

NAVEEN KRISHNA AMBATI

Naveen Krishna Ambati is presently the Founder and Business Head of 'nexTwin Systems Pvt Ltd'.

He has been associated with information technology industry for over decade and leverages his experience and background to identify and design products that are capable of being scaled up and marketed.

Academically, he holds a B.Tech in computer science and MBA.

CDPP CENTRE FOR DEVELOPMENT POLICY AND PRACTICE

CENTRE FOR DEVELOPMENT POLICY AND PRACTICE
10-3-303, 3rd Floor, Serene Heights, Masab Tank, Hyderabad - 500 028, Telangana, India
info@cdpp.co.in | www.cdpp.co.in | 040 - 3516 4255