Smart Villages

PREFACE

In July this year, the Rural Development Department of the Jharkhand government had invited papers from individuals for the purpose of engaging them in a national-level discussion on the concept of Smart Village, and sharing one and another's experiences from across the country with an aim to formulate a comprehensive scheme for the development of rural Jharkhand.

Interestingly, Digital Empowerment Foundation (DEF) has already been working in the same area, making villages smart, for the last 13 years. Thus, to share its ideas, DEF team members Deepshikha Sharma, Ritu Srivastava, Rajat Kumar and Udita Chaturvedi submitted a paper each for the 1st National Convention on Smart Villages, organised by the State Institute of Rural Development, government of Jharkhand. In August, the four members travelled to Ranchi to present their academic papers, which have been compiled into this book.

In India, we believe, there is no lack of information but lack of access to information. DEF, thus, works towards bridging the digital divide in under-served and unreached parts of India to enable better access to benefits and rights for the masses. With this aim, we have initiated and implemented projects like Wireless for Communities (W4C), Community Information Resource Centres (CIRCs), Chanderiyaan and Neerjaal in several parts of the country.

W4C provides a holistic and community-empowerment approach towards connecting rural and marginalised communities to the Internet to enable access to information at the will of citizens outside urban centres.

CIRCs provide DEF the basic backbone needed for rolling out all kinds of digital interventions for development, including digital literacy, in rural and semi-urban areas where citizens live in information darkness.
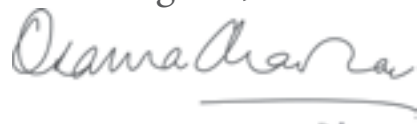
Chanderiyaan is a project that primarily involves inclusive and decentralised use of information communication technology (ICT) and other digital tools in critical aspects of handloom cluster development, especially improving and scaling up weaving skills, designs and marketing, besides creating sustainable livelihood options for the youth in the clusters.

Neerjaal is India's first attempt at bringing forth hard facts about drinking water and sanitation issues through community participation for a village-level water data collection and information system.

This book traces the impact of these four projects in India, and encourages central and state governments, organisations and individuals to implement similar projects in their regions for truly empowering the rural population.

I appreciate the efforts put in by my DEF colleagues in bringing out this special publication for the benefit of the wider rural community of India. I am sure this publication will be an interesting and informative read for all.
Warm regards,

Osama Manzar

Founder-Director
Digital Empowerment Foundation

Table of Content

Neerjaal

COMMUNITY WIRELESS NETWORKS NEEDED TO ACHIEVE DIGITAL INDIA VISION

W4C

"Digital Divide" or "Digital Information Barrier" refers to the substantial asymmetry in the distribution and effective use of information and communication resources. It is widely believed that the global information highway, by opening two-way information flows, empowers communities living in remote areas. This is possible if connectivity is provided to them to access wide range of markets, seek new opportunities, learn new skill sets, get better quality health care and become aware of their rights and exercise them. Poor access to the Internet, however, is currently denying underserved people in India. The government of India has proposed various action plans including the National Optic Fibre Network (NOFN) under its umbrella vision, Digital India. The challenge is not only limited to laying wired infrastructure but also how to connect the country with availability of limited bandwidth. This implies a need of a decentralised model to showcase various patterns of using ICTs and alternative solutions that can create sustainable smart villages.

The paper seeks to understand how grassroots organisations are creating viable smart villages in the country by engaging communities. The paper seeks to set up model of superset of Internet points that are localised and colonialised to meet specific needs of communities. This paper investigates the efficacy of creating community wireless networks (CWN), rural Internet Service Provider (RISP) or community-based Internet Service Provider (C-ISP), and explores the possibility of policies which could help in creating widespread information infrastructure for the larger masses of the country.

1. INTRODUCTION

The emergence of a global 'information society' is driven by the continuing development of converging technologies of telecommunications, multi-media broadcasting and information technology. In just a few years, the Internet has undoubtedly turned into one of the most dynamic communication tools the world has ever seen. The flow of information that it facilitates strengthens democratic processes, stimulates economic growth and allows for cross-fertilising exchanges of knowledge and creativity in a way never seen before. Since the time this powerful tool of development was first introduced, the Internet has undergone profound changes. The Internet has become a key instrument for social, political and economic activities in developed countries and, as broadband penetration increases, will arguably become so also in developing nations. This implies a strong dependency on both the basic infrastructure of the Internet and on the services that use the Internet. It is, therefore, vital that the resilience and stability of this global network and networks is ensured. This seems to be especially the case in the informal sector of the economy and in rural areas where people are more likely to be isolated and information deprived (Essellar et al 2007).

The Millennium Development Goals (MDG)-8: Access to Technology, estab-lished by the United Nations in 2000, was created to promote the adoption of broadband-friendly practices and policies to spread the benefits broadband Internet can offer and to ensure the broadband Internet technologies accelerate progress towards meeting MDGs (UN Millennium Development Report).

The United Nations Task Force on Innovation, Science and Technology in 2005 defined that the growing gap between the haves and have-nots may fundamentally threaten the possibility of achieving the MDGs. It states: "... the gap between people with access to local and global networks and people without such access is widening. Narrowing this gap represents an enormous challenge. The means to meet this challenge are already within reach; failure to urgently and meaningfully exploit them may consign many developing countries, particularly least developed countries, to harmful and possibly permanent exclusion from the network revolution. Within the development community, there is growing awareness that failure to include developing countries in the ICT revolution will have serious consequences for achievement of the goals. Harnessing the strategic and innovative use of ICT in development policies and programmes may enable the world to meet the goals. Without such technology, doing so by

2015 will be impossible." [P. 50 Juma and Yee-Cheong (2005)]

Poor access to the Internet, however, is presently denying underserved people in India and South Asian countries the benefits of the information age. Although India is the third largest nation of Internet users by absolute numbers, Internet penetration in the country, at 19.19 per cent, is still below the 40 per cent global average. It is the same situation in other South Asian countries such as Bhutan, where Internet penetration remains low at 27.7 per cent, Sri Lanka (19.9 per cent), Nepal (12.3 per cent), Pakistan (10.84 per cent), and Bangladesh (6.9 per cent).

The key hurdle in increasing Internet penetration in rural areas lies in last mile connectivity. The huge costs associated with rolling out wired infrastructure, in addition to the lack of commercial viability in localities with a low user base, have in many instances deterred governments and the private sector from prioritising rural connectivity in many parts of the country.

The evolution of networks in developing countries is taking an alternate route from the traditional networks. In developing countries, wireless connectivity has emerged as one of the inexpensive technologies to bridge the connectivity gap in remote areas. Wireless technologies like microwave, WiMax, Wi-Fi-based networks require much lower capital investment than laying down optic fibre. This allows for decentralised rapid evolution of such networks by local entrepreneurs.

This paper brings examples of community-led wireless networks that are connecting the communities living in remote and difficult geographical terrains. The paper also understands various existing and viable community wireless network models that are providing low-cost Internet connectivity in rural locations across diverse communities spread over several states of India.

2. CONNECTIVITY & INTERNET ACCESS INFRASTRUCTURE

Former President, Dr. Abdul Kalam defined PURA (Providing Urban Amenities in Rural Area) to understand the social economic system for sustainable growth. PURA stands for a well-planned drive towards achieving an inclusive and integrated development starting at village household level and evolving village community level (PURA: Ministry of Rural Development Annual Report 2010). PURA involves:

The National e-Governance Plan (NeGP), formulated by the Department of Electronics and Information Technology (DEITY) and the Department of Administrative Reforms and Public Grievances (DARPG), has devised 27 Mission Mode Projects (MMPs) to make government services accessible and affordable for citizens. Internet usage in rural India can be spurred by focusing on the critical factors of 4As – Availability, Affordability, Accessibility and Acceptability.

According to the Internet World Stats (2014), the percentage of people who do not have affordable high-speed Internet is 84 in Africa; 78 in Asia, 37 in Europe; and 22 in North America. These people are lagging behind, in the digital sense, because they are not part of the information society. Such communities usually lack viable commercial incentives to attract telecommunication companies. Wireless technologies have shown much potential to provide high-speed Internet access to any community in any location either through terrestrial telecommunication infrastructure or satellite backbones. These wireless networks are relatively easy and quick to deploy, particularly in cases where towers are not required. The deregulation of the 2.4 GHz and 5.8 GHz spectrum has also given opportunities to non-profit organisations and small Internet stakeholders to build their own wireless networks using Wi-Fi standards and avoiding dependence on a telecom carrier. This kind of low-cost connectivity is important for rural areas, which are less enticing to carriers due to low density and income of potential consumers.

Availability

Affordability

Accessibility

Acceptability

PURA
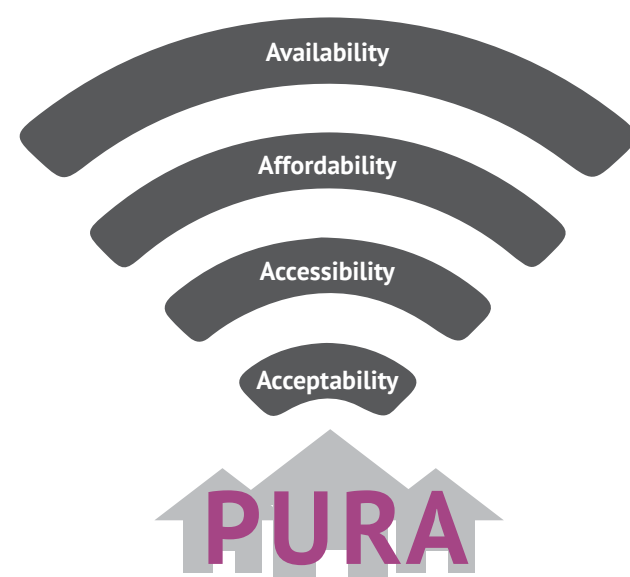
3. COMMUNITY WIRELESS NETWORK AND INFRASTRUCTURE

Community wireless networks (CWN), also known as bottom-up networking, is an emerging model for the 'Future of Internet' where communities are able to deploy, manage and operate their own networks. These networks are part of Internet stakeholders but differ in various aspects such as low cost and effective, public documentation on every technical and non-technical aspect; operate and own open IP-based networks, communities of citizens build, and collective digital participation.

Technically, these community networks are large-scale, distributed and decentralised systems comprising nodes, links, content and services. The networks are dynamic, diverse and governed by open peering agreement that avoids barriers for the participation in the network. Governance, knowledge and ownership of the network are open. Therefore, these networks are not only decentralised but also self-owned and self-managed by community members, and capacity and services are provided by community members. Most of these community networks are often built with simple, low cost and shelf hardware. These nodes are usually running an open source distribution such as Linux (Openwrt) or FreeBSD. In the process of planning the infrastructure and designing the network, CWN and ISPs and other service providers, there are significant key differences. These key differences include the following requirements for planning CWN:

1. Ubiquitous Wi-Fi access covering the whole territory of the community (e.g. a city, a county or a province), no matter if some parts are sparsely populated and/or geographically challenged;

2. Users should be provided with other forms of access as well, depending on the application and the users' needs and economic possibilities. Thus, on one hand, the services must be made accessible via cheap communication services such as 2.5G (GPRS), and, on the other hand, bandwidth-demanding customers have to be served too;

3. Mobility or at least nomadic access across the covered area must be supported;

4. Support of a multiplicity of user devices from simple mobile phones through personal digital assistants (PDAs) and laptops to video conferencing equipment;

5. The network should support a specific set of government, business and society-related applications.

3.1 Existing community wireless networks

In India, there are very few social enterprises working for designing or deploying wireless programmes to cater to citizen communities. AirJaldi in Dharamshala and Digital Empowerment Foundation in Delhi are two organisations which are providing basic connectivity and enabling access to information for citizens outside urban centres, particularly in rural and remote areas.

AirJaldi provides community-based wireless mesh network in cooperation with the Tibetan Technology Centre in Dharamshala. The Mesh backbone includes over 30 nodes, all sharing a single radio channel. Broadband Internet services are provided to all mesh members. The total upstream Internet bandwidth available is 6 Mbps. There are over 2,000 computers connected to the Mesh, and about 500 have Internet access. AirJaldi led to a wireless mesh area network in and around Dharamsala which interconnects thousands of computers within a difficult mountain terrain, covering a radius of around 50 kilometres, and provides broadband Internet access, VOIP telephony, file sharing, offsite backup and video based application. By integrating multiple existing open-source software projects, with a little on-site tuning, the team managed to build one of Asia's largest wireless mesh networks. The network has exceptional affordability, performance and features, suitability for rural settings and communities, modular design enabling expansion in line with needs and demand.

Another example is of Delhi-based NGO Digital Empowerment Foundation (DEF). Its programme Wireless for Communities (W4C) deploys line-of-sight wireless technology and low-cost Wi-Fi equipment, which utilise the unlicensed 2.4 GHz and 5.8 GHz spectrum bands, to create community-owned and community-operated wireless networks. To further localise the initiative, the project strengthens grassroots expertise by training community members in basic wireless technology, enabling these 'barefoot engineers' not only to run and manage these networks but to pass on their skills to others. The programme also provides local content development and technology support to barefoot engineers.

Alongside each network, information hubs known as Community Information Resource Centres are set up to provide digital literacy training to women and youth members, to enable them to utilise Internet connectivity for their own needs. These centres also drive the W4C's developmental agenda, which can be summed up in a single word – AHEAD.

I.   A for awareness-building on social rights and services through online avenues like social media, and on laws and issues such as the Right to Information Act and women empowerment;

II.   H for health, such as telemedicine to connect primary health centres to district hospitals and enable local communities to access health-related information through the Internet;

III.   E for education, with the Doosra Dashak programme for school dropouts, and access to online tutorials, distant learning courses, and online learning materials;

IV.   A for activating entrepreneurship by enabling community members, particularly women, to set up e-Commerce sites and businesses that offer online services like e-Ticketing;

V.   D for delivery of governance online, thus helping to facilitate greater coordination between local governments, expedite the delivery of public services and enhance state transparency and accountability.

In the last four years, DEF has connected over 10 locations through its Wireless for Communities programme. These locations are Tilonia, Baran, Alwar and Chandauli in Rajasthan; Guna, Chanderi and Shivpuri in Madhya Pradesh; Giridih in Bihar; Aizawal in Manipur; Tura in Meghalaya and Nagaon in Assam.

4. COMMUNITY WIRELESS NETWORKS & ENTREPRENEURSHIP

The hub-and-spoke wireless network model has a long-term goal to maximise the benefits of wireless technology for the rural population in sustaining their lives. Thus, to maximise the efforts of wireless technology, it is important to use the technology in sustainable business models. These models could be public-enterprise models and community members could also be part of it.

1

Internet access

Available to students, teachers, community members, and tourists

Email: Free accounts available through *nepalwireless.net* or other web mail services (e.g. Yahoo and Hotmail) to the villagers

Telephone service: Villagers can place ordinary landline phone calls through Internet telephony equipment and the PBX software on the network server.

2

Education

Increase opportunities in community schools by creating a live tele-teaching programme

Provide contents in local languages to students and villagers

3

Health care

Establish a tele-hospital in urban area and link it to district-level hospitals and rural health centres

Provide medical assistances to villagers through a tele-medicine programme

4

Communication

Increase communication facilities in the isolated rural areas by providing:

VoIP phone

Video conferencing facilities

Bulletin board

Internet services

5

Local e-Commerce

Help villagers sell and buy their products in the local market and outside through local intranet and Internet

6

Jobs and business opportunities

Generate jobs for younger generation locally through remittance services

VoIP phone services for International calls

Credit card transaction services for tourists

Secretarial services (photo copy, photo print, document print)

7

4-Cs collaboration

Cyber Café

Community centre

Cinema

Classroom

e-Schools (k-12)
CIRC's/ICT labs,
Gyanpedia

Digital Panchayat
centres: taking
MPs and MLA's
online

Water & Sanitation:
M/s through commu-
nity sourced data

CIRC

Specific
skill-based
vocations

PHC's/CHC's on
Vc's tele-health

e-Cooperatives
(online)

Rural BPO: Call
centre KPO

Community capacity building	Citizen service centres
SMS community newsletter	Digital library
	Training
Community radio	Cyber cafe

eMSME (MSME's
online, clusters
online)

eNGOS (NGO's online)

Agriculture/forestry/:
PISCI culture, market
linkage, etc

Organic food: capac-
ity/processing/pack-
aging/supply market
linkage, e-commerce

Community-based
tourism/eco tropism,
e-tourism, edu-tourism

Handicraft/artisanal
cluster-based design:
Processing-cum-packaging &
market linkages, e-commerce
social commerce

Both examples have proven that community networks are more focused on providing the following components:

1. The first is oriented towards capacity building, where the community receives training on how to establish community wireless networks. Communities are empowered via a structured Training of Trainers programme that equips participants with the information they need to design, deploy, and operate wireless networks. This helps build a pool of local experts, who in turn can train community members. A separate workshop, held in qualified rural locations, introduces local community members to wireless networks and their deployment and operation.

2. The second component is the actual deployment of wireless network infrastructure in rural locations. The technology used is Wi-Fi, which is generally structured in a wireless-mesh-type configuration for redundancy and reach, providing access in and around a community (usually a village).

3. The third entails broadening Internet access in existing locations by expanding Wi-Fi connectivity to surrounding areas. Community workshops, to enable local Internet users to create content and services online, are also carried out.

5. CONCLUSION & RECOMMENDATION

The paper has shown that wireless technology together with unlicensed spectrum is a highly cost-effective way of providing last-mile broadband connectivity to remote rural areas, and can be implemented far more rapidly than the traditional wired approach in India. Existing mainstream Class A ISPs have been hesitant to offer low-cost and high-speed services in remote communities as many of these are commercially unviable. This implies an appropriate policy under Digital India programme that can be developed to promote the emergence of community wireless networks (CWNs) or rural ISPs that are focused on serving underserved communities, thus helping to further accelerate Internet penetration in rural India.

The paper identifies various kinds of business models that can be created by non-profit organisations who can serve rural India as rural or Community ISP. These network providers will not only provide broadband connectivity in rural areas but also set up information hubs for spreading digital literacy and providing digital services to the community at a low cost. The paper recommends further research to understand these community wireless networks.
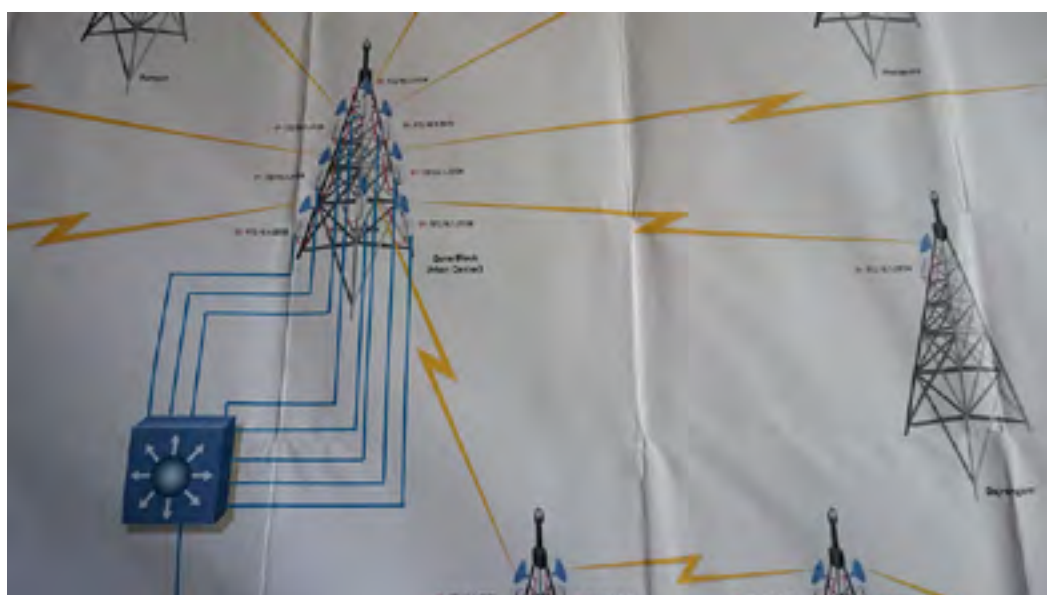
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COMMUNITY INFORMATION & PUBLIC ACCESS CENTRES

CIRC

Information and access are the most powerful tools for a citizen to strive to rights and empowerment of the underserved sections of the society. The entire citizen welfare and entitlement service delivery system is based on information, which could vary from information about scholarship for students, pension for old age, pension for widows, entitlements for disabled, and so on.

According to Chapter II, Section 4 of the Right to Information (RTI) Act, there should be a practice of proactive online disclosure of information by government departments and organisations. Ironically, a baseline study conducted by DEF has found that 90 per cent of the people living at village level do not know anything about RTI let alone all the government entitlements meant for them. Community Information Resource Centre (CIRC) and Soochna Seva Kendra (SSK) are two integrated models that have been created by Digital Empowerment Foundation (DEF) to solve the problem of lack of information and its inaccessibility to the people at a manageable distance round the clock.

This paper finds out how CIRCs and SSKs of DEF, which are spread across 60 districts of India, have been able to provide digital literacy, access to information and proactive availability of public entitlement information to the people living in villages, remote areas, and below poverty line through digital infrastructure and web as a permanent medium.

1. BACKGROUND

'Information' and 'access' are the two most dynamic tools, which propel empowerment of the underserved sections of the society. There is a strong link between the two and it is called 'delivery'. The three pillars can increase the propensity of any programme which is supposed to be meant for its primary target population. DEF believes information is essential at every step of the administration ladder whether it is at state, district, block or panchayat level because it serves as the basis of overall system of public services delivery.

One of the much known Acts, Right to Information (2005), mandates the transparent delivery of information being sought by any citizen of the society in order to promote transparency and accountability within the administration or of any public authority. Furthermore, it envisages putting up public information delivery framework in place so as to systematise the governance structure. Thus, it is imperative to say that an Act like RTI and many other initiatives of the government are totally based out of information, access and delivery.

In fact, one of the major initiatives like Mahatma Gandhi National Rural Employment Gurantee Act (MGN-REGA) is showing an abysmal picture in the state of Bihar. A recent study (Ravallion, Walle, Dutta & Murgai, 2013) reported lower knowledge levels on specific aspects of NREGA such as the maximum time period of 15 days since demand made within which work should be provided, the requirement to pay wages within two weeks, or the fact that the role of contractors is not permitted. An assessment report (Kumar & Sharma, 2014) by DEF at the household level states that 90 per cent of the respondents have no knowledge of RTI at all. This is the situation at the very bottom level of governance where panchayats have been declared as local self-governments to function as institutions at village level (The 73rd Amendment of the Constitution, 1992). Three-tier systems came into force where gram sabha became a cornerstone of the whole institutional setup. Yet, there is no proper structure or service delivery access points. This is leading to serious paucity of information. Accessibility to information is restricted primarily because of lack of effective and public-centric governance structures and limited portals for information dissemination.

It has been found that there is an urgent need to serve the community with maximum amount of information they are entitled to. This can only be achieved through integrated information access centres where the community can convene, learn, be entertained and be facilitated to get benefitted through various other entitlements. The places with such centres then become more community driven, accessible and affordable in terms of digital connectivity as well as information connectedness.

2. INTRODUCTION

"Information poverty is the most sustained and perennial misery that a vast majority of the population is still subjected to. Digital tools and applications can largely solve this problem through information empowerment and entitlement gains reaching up to the last mile. Technology can be a great boon in this game to serve citizens better," believes Osama Manzar, Founder-Director of DEF.

Invariably, dearth of information is observed as a hindrance in the participation rate of people in any development intervention. In an attempt to minimise this paucity, the two integrated and economic models, Community Information Resource Centre (CIRC) and Soochna Seva Kendra (SSK), entail the availability of information and access via ICT infrastructure. With the advent of making people information empowered, there is an exigency to have a comprehensive set of low-cost strategies that are easily adaptable among the community. It aims to reach out to maximum number of people who are devoid of information about various government schemes, entitlements and services. The model also provides access to computers and the Internet through wireless technology, spreads digital literacy, and offers various kinds of offline and online services. Substantially, these two models are working towards a holistic development of the acutely poor sections of the society. The overall framework envisages training and capacity building of the poor by putting technology into their hands through a sheer wall of information.

"Information Needs Assessment Model" (Dhingra and Misra, 2004) is used as a framework to analyse and state the information needs of the rural communities in order to address a variety of issues prevailing within the community; as part of UNESCO's Cross-Cutting Theme project. The variety of information needs has been depicted in the diagram on the following page with regard to the focus areas of Community Information Resource Centre/Soochna Seva Kendra.

This paper seeks to address the causative factors in determining the role of information in the empowerment of deficit and marginalised societies.
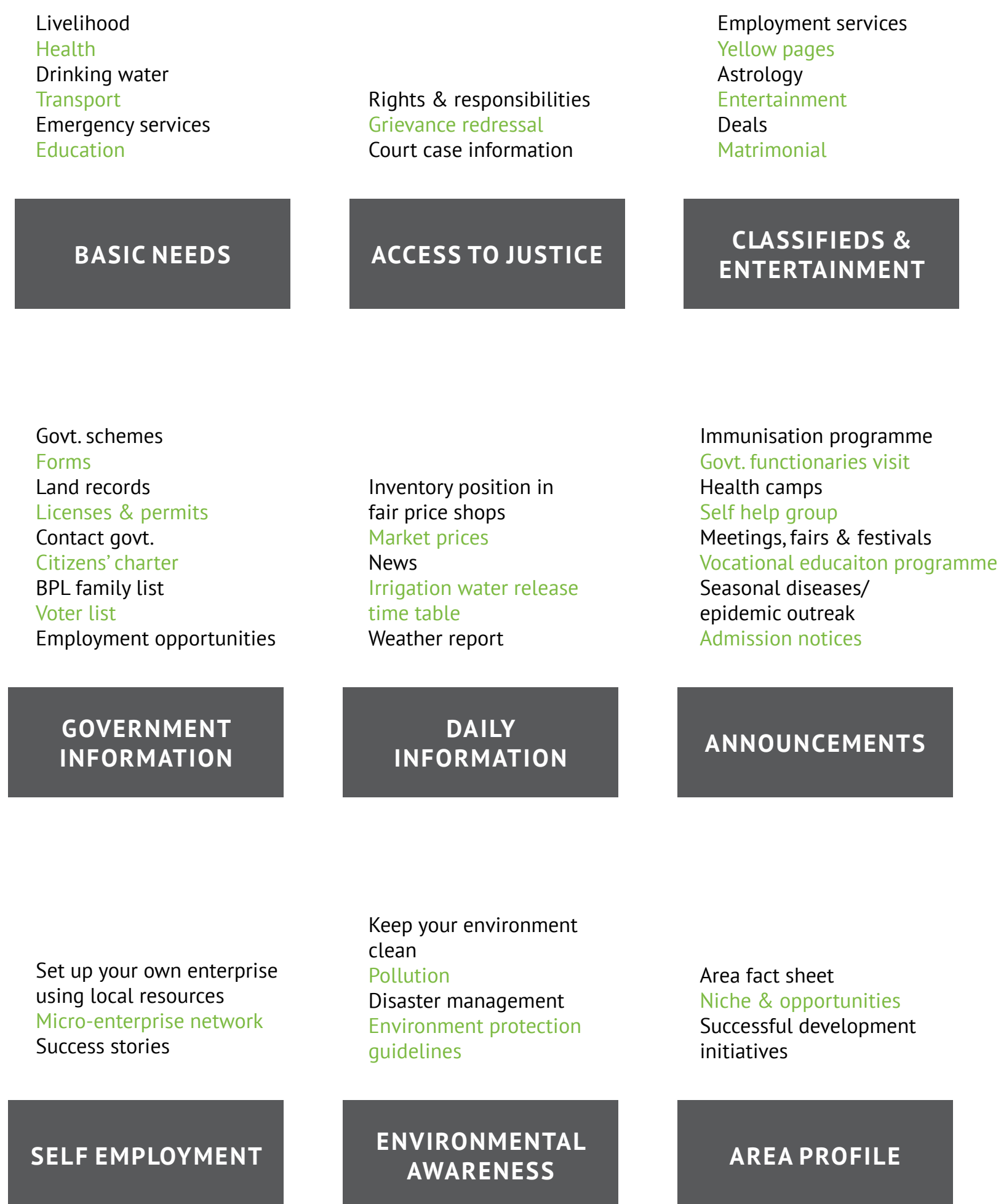
Livelihood
Health
Drinking water
Transport
Emergency services
Education

BASIC NEEDS

Rights & responsibilities
Grievance redressal
Court case information

ACCESS TO JUSTICE

Employment services
Yellow pages
Astrology
Entertainment
Deals
Matrimonial

CLASSIFIEDS & ENTERTAINMENT

Govt. schemes
Forms
Land records
Licenses & permits
Contact govt.
Citizens' charter
BPL family list
Voter list
Employment opportunities

GOVERNMENT INFORMATION

Inventory position in
fair price shops
Market prices
News
Irrigation water release
time table
Weather report

DAILY INFORMATION

Immunisation programme
Govt. functionaries visit
Health camps
Self help group
Meetings, fairs & festivals
Vocational educaiton programme
Seasonal diseases/
epidemic outreak
Admission notices

ANNOUNCEMENTS

Set up your own enterprise
using local resources
Micro-enterprise network
Success stories

SELF EMPLOYMENT

Keep your environment
clean
Pollution
Disaster management
Environment protection
guidelines

ENVIRONMENTAL AWARENESS

Area fact sheet
Niche & opportunities
Successful development
initiatives

AREA PROFILE

Figure 1 Information categories
representing the information needs
of rural communities

3. MOMENTOUS OF COMMUNITY-OWNED INFRASTRUCTURE

In India, several steps are being taken towards institutionalising a community-owned information centre to meet aspects of Millennium Development Goals. However, failures are heading alongside it, in the context of faulty infrastructure with no essence of sustainability. There are 6,40,867 rural units in India where word of mouth is considered the most trusted source of information. This fact is also stated in a recent study; village grapevine is the dominant source of information accounting for over 69 per cent of the respondents (Kumar & Sharma, 2014). The reason behind this is the lack of proper infrastructure at village level where one can go and avail any kind of information or know-how. Availability of infrastructure with respect to both physical as well as Internet connectivity at local level bequeaths local users with various kinds of services in their neighbouring areas. Moreover, it may propel towards diminishing the cost as well as hardship of long-distance travel to the district administration office. For instance, a farmer can access information related to farming practices, a students can find details about scholarship options, and citizens can avail photocopying and scanning services at minimal rates. By and large, preference to computerised system or infrastructure is backed by specific areas where clients have accrued concrete benefits, as stated by Bhatnagar & Singh, 2010.

At present, the entire infrastructure of information gathering, processing, sharing can be found in demand among rural sections. This is because there is neither a standardised public information infrastructure nor has the government ever mandated such a framework at village or panchayat level. In this context, availability of public information network, inclusive of various offline and online services, could serve as the turning point for any development intervention. Thus, information access points are primarily equipped with computers as well as Internet connectivity as a main source of information service.

In a recent study, Kumar (2005) reported that the last decade has seen exponential growth in information and communication technologies (ICTs) with computers, digital organisers, mobile phones, the Internet and wireless computing spreading all across the globe. Hence, there is a serious need to adopt an integrated infrastructure of information and services delivery, necessarily with its existence in purely rural villages. This will accrue a proper flow of information to the community and the services they are entitled to by providing a self-driven, informal, and trusted network of communication.

A lack of a reliable public infrastructure can only be compensated with the implementation of a foundation at local level. This sort of implementation needs to be performed by organisations and individuals who have the appropriate incentives to work with marginalised groups. The model of Community Information Resource Centre, thus, acts as a major facilitator for information transparency, good governance, empowerment, participative management and grassroots democracy through a need-based and credible source.

4. DIGITAL LITERACY, A TOOL FOR SELF-EMPOWERMENT

As per the National Digital Literacy Mission, "Digital Literacy is the ability of individuals and communities to understand and use digital technologies for meaningful actions within life situations."
In accordance with Census 2011, there are 272,950,015 crore people are in India (majority of them in rural areas) and, needless to mention, there isn't even one member digitally literate in each family. Here digital literacy is expounded as a set of skills, required using tools such as computers, smart phones, internet and any other information technology. If being a literate is considered as the cornerstone for the growth and development of any individual, then being digitally literate is almost shown as equal nowadays. It is pertinent that knowledge of digital tools is augmenting as a pre-requisite among all sectors whether it's private or public. And, interestingly, a large population base, comprising rural as well urban population, has been found completely devoid of it.

According to Rao (2005), "Computer literacy is one of the factors having strong influence in addressing digital divide." Being digitally literate is a dynamic tool for self-empowerment as it enriches the proficiency of technology and promotes lifelong learning of an individual. It sets out an open platform, especially for underserved communities to keep abreast with governance at local and national level. Perhaps, this is the reason why the government recently launched 'Digital India', an umbrella programme with digital literacy as its one of the prominent components.

According to Badshah (2010), information technology (IT) skills help build self-esteem, provide an opportunity to gain knowledge, and offer a way for individuals and communities to come together. Programmes that are holistic in approach and go beyond IT training to serve personal and community needs become a catalyst for social and economic empowerment. Therefore, it has become imperative to deepen the reach of digital knowhow in India to empower the next generation with digital power.

CIRCs are computer-mediated and community-owned access and learning points in rural and semi-urban areas of backward districts. It envisions at least one digitally literate person per household across India, irrespective of caste, creed and age.

5. ACCESS TO INFORMATION, A STEP TOWARDS AN INFORMED SOCIETY

Incomplete information about their rights and take-up procedures are possible reasons why poor people do not fully access public services available for them, as it has often been observed in developing countries (World Bank, 2004). It is clear that lack of information decreases the ability of citizens, particularly the acutely poor, to benefit from the any right, scheme or service. For the delivery of information services, central government provision, contracting out to the private and the not-for-profit sectors, decentralisation of local governments, community participation, and direct transfers to households are the prime delivery channels.

The paradigm of Soochna Seva was founded with an idea of strengthening the RTI Act and to address larger issues of poverty, rural development, social exclusion and inequity of marginalised groups through information empowerment. Soochna Seva Kendras are the enhanced channels and points for information services delivery for target groups at their doorsteps to enable them to make informed choices or decisions and avail benefits they are entitled to.

Access to public scheme information has been found to be one of the biggest challenges, primarily in terms of use and final gains from government entitlements. The premise is that a lack of information is a decisive demand-side factor inhibiting successful participatory action from poor people to get the services to which they are entitled (Ravallion et al., 2013).

The government is the designated 'Information Provider' with multitude of schemes, programmes, plans and policies for the welfare of the society. Information seekers are those who are residing in the isolated areas of the rural country, and are totally disconnected from their information providers. It has become evident that there is a wide gap between the two points of communications due to which a larger portion of population lives in is information deficit in a way or the other. In a study, Kumar and Sharma (2014) have indicated that the adoption rate of schemes in rural area is over 70 per cent. However, shockingly, a vast majority reported difficulty in getting the information about different forms. Hence with this fact, availing the benefits of the schemes cannot be imagined where 26 per cent of the population is still illiterate (Census, 2011).

Soochna Seva Kendra access points act as the medium of facilitation required at various stages while applying for different public schemes as well as other services offered by the government. With these access points/channels it is possible to locate all the information related to entitlements, programmes, processes, policies and other services together at one place, closer to the citizens with full facilitation at each step.

6. TRANSFORMATION INTO EMPOWERMENT, OPPORTUNITY AND RIGHTS

Equal access and equal rights are the two preceding elements of the road to empowerment. It offers opportunities to an individual to become self-dependent, self-empowered, and self-motivated in terms of personal growth and development. Nowadays, digital tools are being embraced by various developments agencies, civil society organisations, and central and state governments in the empowering process, particularly for the marginalised who constitute a large number of the country's illiterates. Mobile phones, computers, laptops, tablets and the Internet are examples of such tremendously effective tools. The whole setup of Community Information Resource Centres and Soochna Seva Kendras is furnished with digital technologies as a primary requisite. However, it's not just a matter of putting up an effective and sustainable infrastructure amid the community, there needs to be done more. From Digital Empowerment Foundation's point of view:

EMPOWERMENT

Digital Literacy
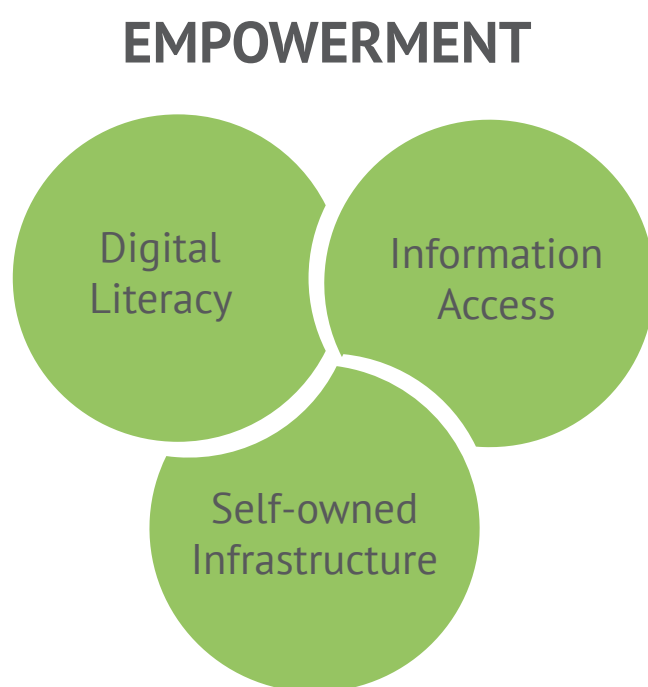
Information Access

Self-owned Infrastructure

Figure 2 Factors leading to empowerment and transformation

Figure 2 highlights the factors that lead to the empowerment and transformation of a community into an information-rich society. Empowerment of the marginalised is inextricably linked to access to information about schemes/entitlements, digital literacy, and a community-owned infrastructure. During the course of action, DEF has realised the potential of these three aspects in strengthening the skills and by providing an enabling environment to the communities in remote areas across India. A range of success stories (at *defindia.org*) reveal the whole cycle of transformation underlying the importance of information and access via ICT.

7. CONCLUSION AND FUTURE PLAN

It can be inferred that a void of information reduces the efficacy of intrinsic motivation of an individual. All the efforts share a common goal: to offer people of all ages and abilities free or low-cost access to resources, and access to information about public scheme and entitlements. It also enables them to learn about computers, use the Internet, develop other digital skills, explore new careers, and facilitate active participation in local governance. A number of people have evidently improved their lives through availing information and, thereafter, have witnessed a transformational impact on their community. At present, there are 118 centres (CIRC and Soochna Seva Kendras) in 54 districts of 19 states and the potential attempts have touched the lives of more than 11,50,000 people. Moreover, it still continues to refine the approach more in terms of creating a huge impact through information empowerment.

It's a time for civil society groups, and various development and government agencies to convene and create visions to bring in credible changes with an informed society. And this can only be achieved through an effective implementation of a public-centric information model. Thus, it can be said that advent of such an information-based intervention should be set as a pre-requisite for all development programmes.

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CHANDERIYAAN
cluster development through technological intervention: a study of Chanderiyaan

CHANDERIYAAN

Chanderiyaan is a pilot model started in Chanderi, Madhya Pradesh, that primarily involves inclusive and decentralised use of Information Communication Technology (ICT) in critical aspects of traditional skill-based cluster development, especially to scale up weaving skills, designs, marketing and entrepreneurship, besides creating sustainable livelihood options for the youth in the clusters and ensuring integral support system in the cluster. A key purpose of Chanderiyaan has been to meet the demand and supply chain of authentic Chanderi handloom products. Chanderiyaan is a network of the weavers, for the weavers and by the weavers, and is managed by self-help groups, community members, barefoot designers and digital soldiers. Besides meeting the demand and supply with extraordinary efficient system of digital tool usage, Chanderiyaan has also considerably reduced the role of middlemen who were exploiting the weavers, encouraged youth to return to their family profession, helped infuse contemporary elements with traditional designs, provided an e-Commerce platform for direct access to market and increased the household incomes of the weaver families.

This paper discusses the growth of Chanderi cluster's revenue from Rs. 65 crore to Rs. 150 crore as members of the weaving community are now better informed, well connected to the market, have access to developed digital infrastructure and have created an environment of entrepreneurship. The paper also investigates how the government-funded social initiative of Chanderiyaan transformed into a self-sustainable social enterprise.

1. INTRODUCTION

1.1 CHANDERI, THE PLACE

Located in the Bundelkhand region of central Indian state Madhya Pradesh, Chanderi is rich in heritage, culture, tradition and art. While there is no exact proof of documentation stating when people started living in Chanderi, the town has seen the rise and fall of several dynasties right from the Vedic period.

However, it must be noted, that when a famous traveller and chronicler, Ibn Batuta, passed through Chanderi in 1342, he wrote about his experience, and described the town as "one of the big cities of India with sprawling bazaars, full of people and goods".

Today, Chanderi is not "one of the big cities of India". It is, in fact, a small town. But it is still sprawling with bazaars, full of people and goods, especially hand-woven sarees.

If one starts peeling the layers of history in Chanderi, one can find archeological and cultural remains of various religions and communities, proving its secular environment. This rich heritage and ancient history has given birth to numerous myths and folklore, besides folk art and traditional craftsmanship.

1.2 CHANDERI, THE ART

The country today recognises Chanderi not for its heritage and architecture but for its handloom-made silk fabrics and fine patterns. Chanderi's economy has always been dependent on the fortunes of its weavers.

At present, there are about 4,500 weavers and an equal number of handlooms in Chanderi, which has a population of approximately 40,000. Sixty per cent of these weavers are members of the Muslim community. The sarees that are made in Chanderi are sold world over, courtesy their exquisite nature. This is the reason Chanderi is perceived as a brand today.

Banking on this glory are weavers in different parts of the country — especially Varanasi, Kota and Bengaluru — that are making "Chanderi sarees" on powerlooms. Unfortunately, not every customer can difference between authentic and fake Chanderi sarees. Those who can, understand the value of Chanderi silk and the effort that goes into making one. It is interesting to note that Chanderi is also the home to several National Award-winning weavers. Chanderi stoles were even given to athletes who were felicitated at the 2010 Commonwealth Games. So Chanderi is not unheard of.

Weaving in Chanderi first began in the 1920s. Over the centuries, Chanderi silk has seen some transition in the form of the colours used and patterns experimented with. However, the traditional style of handloom weaving, which requires extremely careful handling of the delicate yarn, has stuck through the ages — thus, making it one of the finest hand-woven products manufactured in the country.

1.3 WEAVING SKILL

The process of handloom weaving, as expected, is not an easy task but involves several processes and techniques. In Chanderi, the process of weaving starts with the arrival of raw silk *lachhis* that are brought from Bengaluru and Pune. Meanwhile, a design for the saree is created. The white yarn is then dyed into the desired colours. When dry, the dyed yarn in rolled in the form of *pindi* or *dauga* — enough to make 12 sarees — over a *charkha* (spinning wheel), following which the loom and the yarn is fixed. Once the loom is set, at least 12 sarees, each 6.5 metre long, have to be weaved before the loom can be set up again for a new design.

Until 2009, designs were only hand-made by specialised master designers on graph papers and then copied onto the loom by weavers. Designing alone was a week-long process, and there were only three of four designers back then amid a population of 4,500 weavers.

2. CHALLENGES

According to an estimate, there are about 2,000 artisan clusters or traditional skills-based clusters in India2. Unfortunately, most of them are suffering from exploitation, poor living conditions, extremely low wages and inaccessibility to market. The reluctance of younger generation to engage in their traditional arts and handicrafts is another reason why many traditional crafts are facing a slow and gradual demise today. The story was no different in Chanderi. In fact, besides all of these gaps there was another challenge that had to be addressed: the challenge of eliminating *baithak* (idle time) to increase productivity. Hence, measures had to be employed for the immediate boost in productivity and sales, and there was an urgent need to involve and engage the youth from the community to revive the traditional craft and ensure that it sustains as a viable employment or entrepreneurial option.

3. LITERATURE REVIEW

In the last decade, several state governments have launched cluster development projects to improve the livelihood of traditional handloom weavers and craftsmen in India. Samudragarh, Burdwan and Santipur Nadia in West Bengal; Bargarh in Odisha; and Rajpura Patalwas in Rajasthan are some of clusters where government involvement has helped the handloom weaver community. Weavers in these clusters have received financial assistance, training, easy access to raw material and direct access to the market through fairs, *haats* and exhibitions, especially organised by the respective state governments for the better reach of the handloom products.

For example, the West Bengal government, for each cluster that it selected — and there were 20 of them — assisted in setting up dyeing units, common facility centres and showrooms. The government also initiated buyer-seller meets, and used various print and electronic mediums for the promotion and publicity of handloom products. Workshops on dyeing, weaving and marketing were organised and weavers were informed about market research3.

In Bargarh, Odisha, the state government majorly supported marketing, and set up a cooperative society under the name of Boyanika — retail stores of which were opened across the country. Under this cooperative society, a raw material bank was opened, barcoding was implemented for a stamp of authentication and sale branches were computerised. Eventually, thanks to Boyanika, the sale turnover in Bargarh increased from Rs. 1,244.07 lakh in 2006-2007 to Rs. 5,262 lakh in 2011-2014.

In Rajasthan, under the Rajpurapatalwas project of the Handloom Cluster Development Initiative started in 2008, the government extended support in the areas of design and skill development, technological upgradation, value addition, and

imparting knowledge about entrepreneurship and marketing.

A common feature in all these government-led cluster development projects is that they focus on marketing and marketing-oriented activities and cooperatives, however marketing is managed by the government or cooperatives. While cluster development was witnessed, and there was increase in sales but a holistic approach towards the skill development and promotion of industry seemed to be missing.

Chanderiyaan, however, looks at the development of the handloom industry under a larger microscope. Under Chanderiyaan, weavers' skill is developed not just through PowerPoint presentations and oral seminars or workshops but through digital intervention and hands-on training. Weavers were taught to use computer-aided design software to make better designs in less time and with more accuracy. Following skill development, they were pulled from information darkness — a step that is absent in most government initiatives — and given access to the Internet and taught how to use it to find information regarding their industry on their own, reducing their dependency on middlemen, government agencies and trade experts. With the access to the eventual information and knowledge, weavers could no longer be exploited. Instead, they could get raw material for the right price, sell products at justified rates and market their products on their own.

4. EMPOWERING THROUGH TECHNOLOGY

Some of the key ideas behind starting the Chanderiyaan project were to develop the skill of traditional weavers, push forward the rural handloom industry and increase the monthly household incomes of the families in Chanderi.

Until 2009, weavers in Chanderi had little or no knowledge of prices of raw materials. They were heavily dependent on the middlemen. They paid what the middlemen asked them to, and believed what the middlemen quoted. The weavers did not even design on their own but remained dependent on master weavers or design experts. Due to this lack of information, clubbed with no direct access to the market or customers, most weavers only earned about Rs. 1,500 to Rs. 2,000 a month despite producing some of the most beautiful sarees.

In an effort to eradicate this information poverty among weavers about their own trade and to improve their livelihood, Delhi-based non-profit Digital Empowerment Foundation decided to initiate a digital literacy and technical education project for the weaver community of Chanderi.

Chanderiyaan is the project and brand name given to the digital resource centre, Chanderi Weavers ICT Resource Centre, set up in Ashoknagar district of Madhya Pradesh by DEF in collaboration with Media Labs Asia and supported by the then Ministry of Communications and Information Technology.

The project officially commenced on February 9, 2009. Under the project, computer training centres were set up in Chanderi. Ten computers each were installed for the design centre (managed and run by three trainers) and for the basic skill training centre (manned by two trainers), eight systems were installed for the process of digitisation (under the guidance of two trainers) and 26 were installed in 13 schools and madrasas. In October 2010, these centres were connected to the Internet — now also acting as cyber cafe — and the weavers were connected to the world, making Chanderi one of India first "Smart Village".

4.1 SKILL DEVELOPMENT IN RURAL ECONOMY

Until 2010, there was rampant exploitation at the hands of middlemen, a 60 per cent literacy rate, a 100 per cent digital illiteracy rate, none of the 13 schools in the area had a computer lab, there were hardly any medical facilities and the craft of handloom was facing extinction7.

Lack of regular and sufficient monthly income and the time-consuming process of weaving was discouraging children from learning the skill and encouraging the youth to migrate to other professions and other cities.

At the digital resource centres, weavers learnt how to make new designs using special design software Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM). The weavers also began to digitally document and store their designs. This helped them later if they wanted to retrieve a particular traditional design from the database, take a print out and weave a saree. They could also play with the existing designs and add new elements to it, making the sarees and other handloom products more contemporary yet traditional. The rich design library has also tremendously improved their productivity and accuracy while considerably reducing their cost and *baithak* (idle time).

Earlier, master weavers had several weavers working under them. These weavers earned a weekly wage from the master weavers who would also provide them with the design and raw materials. Later, the middlemen would take the finished product to the market and pocket the entire profit which often ran to a few thousand rupees. When the master weavers and designers were the only one creating patterns, the weavers also had to sit idle, often for weeks, waiting for the design to be completed so that they could start work on the looms. With the help of CAD/CAM and a design library, the weavers began to design themselves or choose an existing one from the design database. Weavers could also modify designs immediately without the need of starting from the scratch, even if there was an error. Even the master weavers could now keep a new design ready even before the weaver finished working on the previous one.

According to a report by two marketing professors from IRMA, Chanderiyaan has reduced weavers' dependency on master weavers by 90 per cent and the former's *baithak* by almost 100 per cent.

Another important feature of the Chanderiyaan project has been the introduction of a Jacquard loom, which further helped the weavers speed up the process and ensure higher wages for them.

Women, too, were empowered and encouraged. In the stitching and designing division — equipped with five sewing machines, a drawing frame, a drawing table and other design-related equipment — women were trained in stitching and apparel designing, keeping in mind the contemporary market demands, to increase their role in the handloom industry.

Through these ICT interventions, not only has skill been honed and developed further but even the average monthly income of the weaver has gone up. Earlier, a weaver received a weekly wage of Rs. 800-1,000 for each saree — and he made four sarees in a month. Today, for each saree, a weaver receives anything between Rs. 2,000-3,000.

Meanwhile, the Chanderi Integrated ICT for Development Programme (CIIDP) has facilitated the propagation and adoption of ICT in the areas of education, health care, social entrepreneurship and tourism to ensure every individual's wellbeing and alternate source of income, respectively.

Basic computer education was imparted to every child and woman who was willing to learn, and there were quite a few of them. Computer labs were set up in all the schools, complete with all the required facilities and infrastructure. Health care and tele-medicine facilities were established, and linked with the Ashoknagar District Hospital.

Women and youth were trained in ICT skills to start social enterprises. Vocational training was given to help them establish an alternative source of income while training in basic English language and comput-

ers ensured their overall development and capacity building. Through the ICT training, several youngsters have set up their digital centres in Chanderi, offering services ranging from printing and scanning to e-ticketing and filing online applications, thereby increasing the monthly household income for many families.

In the last five years, some 800 to 1,000 children have received basic computer training and over 100 youth have received a diploma in computer application or designing. Many of these youth have bought personal computers and design at home instead of at the community design resource centre. At least 50 other have turned into social entrepreneurs. In fact, after learning computers at the ICT centre, many people got computers in their houses or at least an Internet connection for their mobile phones. At least 50 households have been connected with Wi-Fi in Chanderi, and there is at least one digitally literate person in almost every household today.

Besides training the locals and ensuring their skill development, the Chanderiyaan project has also been a learning opportunity for the students of National Institute of Design in Ahmedabad who often visit Chanderi for on-field training.

4.2 RURAL INDUSTRIES IN GLOBALISED MARKET-DRIVEN ECONOMY

When the Chanderiyaan project was started in 2009, the handloom industry in Chanderi was on a steep decline. There was little demand for their products due to inefficient marketing and the powerlooms were being seen as a major threat. The sarees that took at least a week to be made on handloom were being produced on powerloom in a few hours in Varanasi and Kota, and being sold as 'Chanderi' at much cheaper prices. And there was no way in which a lay customer could differentiate between an authentic handloom Chanderi and a fake one.

These concerns, coupled with low wages and a time-consuming process, kept youngsters away from the craft. However, today, the younger generation is using Computer Aided Design software to develop new, modern and accurate designs to appeal to the aesthetics of the contemporary taste of the customers.

There are several reasons that have made Chanderiyaan a successful initiative in taking the rural industry to the global market. Firstly, computer training helped weavers create designs that were meticulous and intricate in nature and, at the same time, at par with those prepared on powerlooms. Through the CAD/CAM software, the designers also became open to experimentation with new designs as well as old patterns that had been digitally preserved. The aim of integrated digital cluster development programme, from the very beginning, has been to incorporate the entire weaver community in some way or the other to bridge the gap between the weavers and the market by eliminating the role of profit-hungry middlemen and similar agencies in an effort to make weavers and their families self-sustainable, self-reliant and self-sufficient.

Secondly, weavers were made aware of the prices of raw materials and the cost of a finished product in the local market or when exported to other cities in India and across the world. This knowledge helped them tremendously in asking for their rightful wages from the master weavers, designers and middlemen.

Thirdly, weavers were able to access the market directly without a third party involvement. This was possible because with the access to information,

weavers were finally able to display and sell their products through retail stores, exhibitions, fairs and the Internet.

Under the integrated digital cluster development programme, several handlooms have been made available to the weavers who now have easy access to raw materials and can make their own designs. DEF too provides weavers with designs to produce *dupattas*, stoles, table cloths and more that can be directly sold through a website.

The greatest ICT intervention for the weavers under the Chanderiyaan project has been the launch of their exclusive e-Commerce website. The website, *www.chanderiyaan.net*, has minimised the role of middlemen and given weavers direct access to the market around the globe. Today, weavers get orders from all over the world and they divide the profits among themselves. In the last one year, *www.chanderiyaan.net* has recorded a sale of handloom products worth Rs. 5,22,1406, and efforts are on to boost the sale further. The weavers, through Chanderiyaan, had previously also collaborated with e-Commerce portals such as PayTM to sell their products.

Collaboration with online portals has also been initiated by some state governments for some handloom cluster development. However, having an exclusive e-Commerce portal helps in building a brand rather than just selling products.

Chanderiyaan has always managed to sustain as a self-help group. Even when it comes to the logistics of the e-Commerce website, weavers manage it all by themselves. It is the weaver community that photographs products on mannequins or models, uploads them on the website, manage customers, handle delivery and keep an account of sales.

Many weavers have even taken personal Wi-Fi connections to sell products directly from their homes through the website and social media pages after receiving training under DEF's Wireless for Communities project.

What was a Rs. 65-crore industry in 2009 went on to become Rs. 100-crore industry and then an industry worth Rs. 150 core in 2012. In the last two years, there has been another 10 per cent hike at least. According to a study by the Indian Institute of Technology-Kharagpur, Chanderi's turnover from the weaving cluster has tripled simply by removing the information asymmetry.

5. CASE STUDIES

Mohammed Furqan is a Chanderi-based weaver who has seen some major transformation take place through Chanderiyaan's ICT interventions in the last five years.

"Chanderi has always seen many ups and downs. When the Chanderiyaan project was started, our handloom industry was going through one of its worst phases. People, especially youngsters, were quitting the trade in search of jobs and professions that gave them a more stable income. However, things took a turn for the better after weavers were trained in designing. It wasn't easy because we had never even seen a computer before but we had the best support. Suddenly, the sales improved and incomes became higher. With the e-Commerce website we now sell our products through computers and even mobile phones," says Furqan who now has about 25 to 30 computers under him at the ICT centre.

While Furqan's life has changed ever since he learnt computer-aided designing, a young weaver has also benefitted from the basic computer training programme.

"Business is gradually picking up as more and more people learn about the digital services I'm providing. Before the Chanderiyaan project started, we used to earn only Rs. 2,000 to Rs. 3,000 a month. Now we can earn at least three times more than that not only from our traditional weaving business but also through the digital services that we can offer," says Mohd. Asif who runs a shop from his home where he provides all kinds of digital services including mobile recharge, Haj and Umrah travel arrangements, scanning and printing.

There have been many others — weavers, youngsters, children and women — who have benefitted from the Chanderiyaan project in some way or the other.

6. CONCLUSION AND FUTURE WORK

The handloom and handicraft sector is the second largest employment sector in India after agriculture. A large number of people in both rural and semi-urban areas of the country are directly or indirectly dependent on handloom and handicraft. Yet, it is always seen as a dying industry, especially due to commercialisation, modernisation and mechanisation in today's global market-driven economy.

While there are several government policies and programmes, including central and state-level cluster development programmes, for the benefit of the handloom weavers, there has been little improvement in the socio-economic conditions of weavers in India. For example, in the last 10 years, the monthly household income of weavers in Nuapatna has only marginally increased from Rs. 2,000 in 2005 to Rs. 3,000 in 2015.

Fortunately for Chanderi, their products and town name have always been associated as a "brand". This has mostly helped maintain a steady market for Chanderi sarees and other apparel. However, the profits had always been pocketed by the middlemen or the master weavers, leaving the real weavers with only a marginal wage.

The Chanderiyaan project thus, became an example of how digital intervention can change the lives of communities dependent on arts, crafts and handloom for a livelihood.

A plan is underway to organise a Chanderi Mohatsav to create awareness about the authentic brand Chanderi and boost sales further. Future work also involves establishing Chanderi as a perfect destination for rural tourism. For this purpose, the history and heritage of Chanderi, through its

many monuments and sacred spaces, has already been documented on Web and in print. Rural tourism will then become Chanderi's third source of income after handloom and digital services shops.

Through the several ICT interventions, especially wireless connectivity across Chanderi, DEF has been able to successfully encourage capacity building and community participation, create a repository of over thousands of designs; support tele-health projects; give access to the Internet to schools and madrasas, provide last-mile connectivity, ensure citizens have access to information on market and government policies, provide alternative sources of income while encouraging the youth to stick to the traditional craft and ensure the overall empowerment of the weaving community.

While Chanderiyaan has ensured that there is at least one digitally literate person in almost every house of Chanderi, DEF hopes that integrated design resource centres will lead to 100 per cent digital literacy in the town in the near future, making Chanderi the "Smartest Village" in India.

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ICT MEDIATED COMMUNITY WATER MANAGEMENT AND DECISION MAKING

NEERJAAL

Community-based water resource management is a valuable tool that strives to sustain and improve environmental health through a natural resource management approach that integrates locally driven initiatives. It seeks to bring together stakeholders to identify issues, needs and strategies; integrate social, economic and ecological concerns towards generating comprehensive solutions. The increasing penetration of Information and Communication Technologies (ICTs) presents a great potential for communities to connect with government officials, policy makers and other relevant stakeholders that would have; under normal circumstances; been inaccessible for them. What is important is that this ease of sharing information through ICTs should also decrease the time taken for members in a community to acquire equal knowledge about the issue at hand and to encourage faster collaboration and quicker and more informed decision making about these community water resources.

This paper seeks to examine this claim by examining literature and feedback from the 'Neerjaal' portal, developed by the Digital Empowerment Foundation (DEF) in association with Social Work Resource Centre and the Barefoot College, in Rajasthan.

1. INTRODUCTION

1.1 Water and the Millennium Development Goals

Water maintains healthy natural ecosystems and is a key driver in socio-economic development. Access to water is crucial for food production; clean water enables good sanitation and hygiene which prevents diseases and improves living standards (UN-Water, 2008).

The Millennium Development Goals (MDGs), established by the United Nations in 2000, sought to create a blueprint to combat some of the biggest problems facing the human race. Many of the MDGs such as ending poverty and hunger, promoting child and maternal health and environmental sustainability, have a direct relationship with effective management and promotion of water resources.

With the conversation surrounding the post-2015 development agenda, the Rio+20 Conference outcome document 'The Future We Want' (United Nations General Assembly, 2012) proposed the creation of what have come to be known as the Sustainable Development Goals (SDG).

Goal 6 of the SDGs exclusively deals with the availability and sustainable management of water resources. However, Goals 3, 11, 12 and 15 also mention water in their targets. Water management has linkages with climate change resilience, population growth, irrigation methods, quality of water, waste due to poor infrastructure, fluctuating annual rainfall and lack of effective legal and regulatory mechanisms.

1.2 Integrated Water Resource Management

To face these challenges of contemporary water management, targets are not only needed at a global level. Action has to be taken at national, regional and community levels (UN-Water, 2006b). Integrated Water Resource Management (IWRM) was adapted by the United Nations in 1992, and has come to be recognised as the best method for efficient, equitable and sustainable development and management of the world's limited water resources, and for dealing with competing demands.

The Global Water Partnership defines IWRM as "A process which promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." (GWP)

The concept of IWRM was first established on the International Conference on Water and the Environment (ICWE) in Dublin 1992. The Dublin Conference led to four principles with regards to water (GWP, IWRM - At a Glance)

I   Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment

II   Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

III Women play a central role in the provision, management and safeguarding of water

IV   Water has an economic value in all its competing uses and should be recognised as an economic good.

IWRM is also envisioned not as an end in itself but a means of achieving three key strategic objectives.

I   Efficiency to make water resources go as far as possible;

II   Equity in the allocation of water across different social and economic groups;

III Environmental sustainability to protect the water resources base and associated ecosystems.

1.3 Information Communication Technologies for Development

Heeks et al., 2001; Negroponte, 1998 and other scholars have shown the importance that Information Communication Technologies (ICTs) have on furthering the development agenda. They also show that ICTs can be applied to a wide spectrum of projects for development.

Panchard & Osterwalder (2008) argue that most ICT for development literature have a strong focus on what they call Person-to-Person Information Systems (PPISs). PPISs are defined as information systems that connect people to each other, connect people to machines and those machines to each other.

They argue further that a concerted effort should be placed in shifting from PPISs to Environment-to-Person Information Systems (EPIS). EPISs would use sensors to collect environmental data and communicate them to man and machine.

The International Telecommunications Union underscored the importance of information for effective utilisation of ICTs for environmental management and protection by identifying six specific environment-related impact areas of ICTs.

I   Environmental observation - terrestrial, ocean, climate and atmospheric monitoring and data recording technologies and systems and geographical information systems (GIS)

II   Environmental analysis - land, soil, water and atmospheric quality assessment tools, including technologies for analysis of atmospheric conditions including GHG emissions and pollutants, and the tracking of both water quality and availability.

III   Environmental planning - making use of analysed information as part of the decision-making process at the international, regional and national level

IV   Environmental management & protection - managing and mitigating impacts on the environment as well as helping adapt to given environmental conditions

V   Impact & mitigating effects of ICT utilisation - increasing efficiency and reducing the secondary & tertiary effects of ICT utilisation

VI   Environmental capacity building - increase public awareness of environmental issues and priorities, the development of professionals, and integrating environmental content into formal education

The environment-related ICT impact areas as identified by the ITU show a very strong synergy with the steps in the IWRM planning cycle (Figure 1).

ESTABLISH STATUS AND OVERALL GOALS

1. Water resource issues
2. Goals and progress towards IWRM fraemwork
3. Recent international developments

MONITOR AND EVALUATE PROGRESS

Indicators of progress towards IWRM and water infrastructure development framework

IMPLEMENT FRAMEWORKS

1. IWRM framework
2. Framework for water infrastructure development
3. Building capacity

IWRM PLANNING PROCESS

BUILD COMMITMENT TO REFORM PROCESS

1. Political will
2. Awareness
3. Multi stakeholder dialogue

ANALYSE GAPS

1. Water resources management functions required
2. Management potentials and constraints

BUILD COMMITMENT TO ACTIONS

1. Political adoption
2. Stakeholder acceptance
3. Identify financing

PREPARE STRATEGY AND ACTION PLAN

1. Enabling environment
2. Institutional roles
3. Management instruments
4. Links to national policies

Figure 1: Source: 'IWRM Planning Cycle', GLobal Water Partnership

2. ICT-MEDIATED WATER RESOURCE MANAGEMENT IN INDIA

The report of the Expert Group on Groundwater Management and Ownership of the Planning Commission (2007) had reported that in 2004, 28 per cent of India's blocks were showing alarmingly high levels of groundwater use. An assessment by NASA (in Planning Commission, 2007) showed that during 2002 to 2008, India lost about 109 cuKm of water leading to a decline in water table to the extent of 0.33 metres per annum. Since the 1980s, India's groundwater dependency has skyrocketed and according to the United Nations World Water Development Report, the groundwater abstraction rate in 2010 for India was over 250 cuKm per year. (Figure 2)

Groundwater and surface water sources are at risk in India due to excessive dependency and unchecked and unregulated waste contamination. The high presence of fluorides, nitrates, chlorides, total dissolved solids (TDS), pH, salinity and bacteriological content are the key areas of concern with regards to water supply sources in India.

The National Action Plan on Climate Change (NAPCC), formulated in 2008, focused on various identified goals with regards to water management through its mission mode project, National Water Mission. The ones that relate the closest to the use of community-level ICTs are:

Figure 2: Groundwater abstraction rate in selected countries (Km3)

I   Comprehensive water database in the public domain

II   Promotion of community-focused participative actions for water conservation, augmentation and preservation

III   Increased water use efficiency in the tune of 20 per cent, and
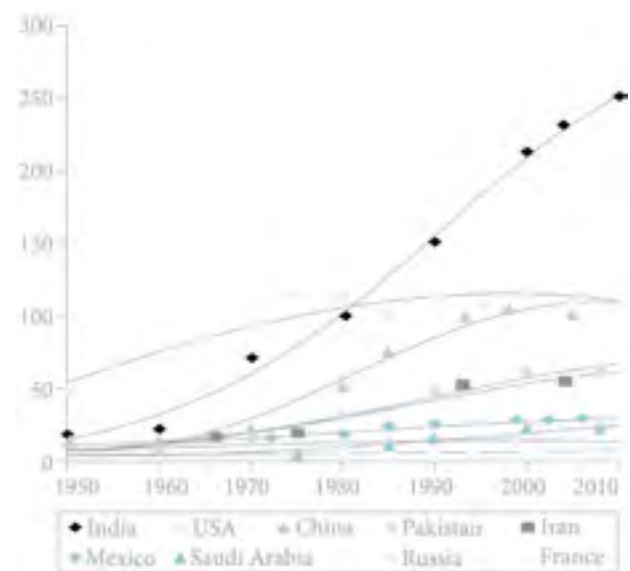
IV   Promotion of basin-level IWRM

3. NEERJAAL

3.1 Introduction

Neerjaal, initiated by the Digital Empowerment Foundation (DEF) and the Social Work Resource Centre (SWRC), is a web-based water quality mapping tool that seeks to create a water management portal for grassroots communities. The intention of the project is to empower communities to collect information about water resources in their vicinity, create and share reports and to make informed decisions for water management. Another focus area of the project is to spread awareness about health and environment-related issues; since effective water conservation and management have a strong positive correlation with those issues, as evidenced by the targets within the MDGs and SDGs.

The first activity in the roll-out of the project was to map all the water sources in a geographical region that communities access: hand-pumps, wells and tanks. This was a participatory process with all members of the community aiding in the identification, mapping and codification of water sources.

Using portable water testing kits, communities then test water sources on a regular basis. The results of the test are passed onto the field centre representative who then transcribes the raw data onto an online reporting and documentation portal (*neerjaal.org*).

The parameters that the water is tested on are:

Physical Properties
A. Odour
B. Colour
C. Turbidity
D. Temperature

Chemical Properties
A. Total Dissolved Solids (TDS)
B. pH
C. Chloride Content
D. Fluoride Content
E. Hardness
F. Nitrate Content
G. Iron Content
H. Bacterial content (e. Coli)

The parameters that are in excess of the standards laid down in the Indian Standards of Drinking Water created by the Bureau of Indian Standards are identified and then an assessment of the quality of water formulated and attached to the water source.

The field centre representative also aids in the creation of a qualitative report that is available for the communities and is forwarded to local government officials, politicians and policy makers. The project incorporates strong online and offline components that aid the community to have strong evidence-based information about water quality in their region and allows them to make well-informed decisions on water resource management.

3.2 Offline and Online Components of Neerjaal

The offline component of the project focuses on augmenting the flow of information to make it more horizontal and allow greater community stewardship and ownership of water resources.

I Community sensitisation - relevant sections of the qualitative report are shared with members of the community so as to sensitise and align them with a realistic understanding of the quality of water in their community. This process is conducted at group meetings (gram sabha, mahila mandal meetings, SHG meetings etc) and direct one-on-one communications.

II Capacity building - To allow greater decentralisation of the testing procedures, community members are trained to test water themselves and pass the results onto the field centre representative.

III Water conservation and management efforts - Neerjaal has initiated water recharging and conservation techniques across communities.

The online component of the project allows government officials, researchers and policy makers to access the raw water testing data entered by the centre representative to aid in the creation of high-level reports and policy and project suggestions using first-hand data that is collected at regular intervals.

3.3 Understanding Information Flows in Neerjaal

A study conducted by Rampal (2014), sought to assess the impact of the Neerjaal project. An assessment of the flow of water related information in the communities where Neerjaal was active shows that 80 per cent of the respondents received information from fellow community members. The Neerjaal facilitator followed close behind at 79 per cent. Only 4 per cent of respondents claimed that they ever got any information from government departments (Figure 3).
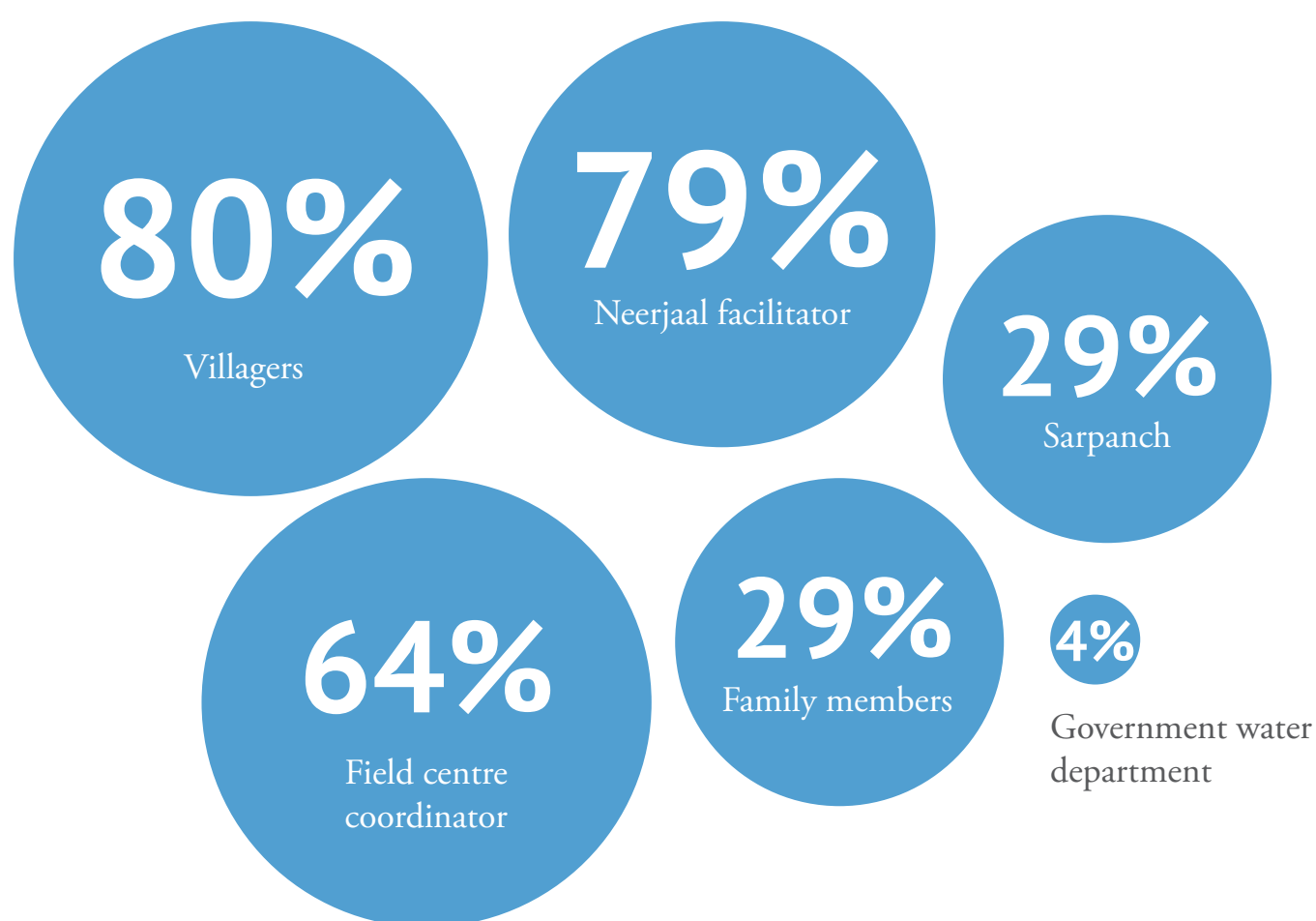

80% Villagers

79% Neerjaal facilitator

29% Sarpanch

64% Field centre coordinator

29% Family members

4% Government water department

Figure 3. Source of water related information as a percetage of respondants. Adapted from Rampal, I. (2014), Water Resource Management in Rural Communities: a study of Neerjaal Project in Rajasthan. Unpublished

The information flow among communities involved in the Neerjaal project has been visualised in Figure 4. The feedback loop incorporated in the water management process is the formalisation of the learning mechanism inherent in the creation of truly participative IWRM mechanism as shown in Figure 1
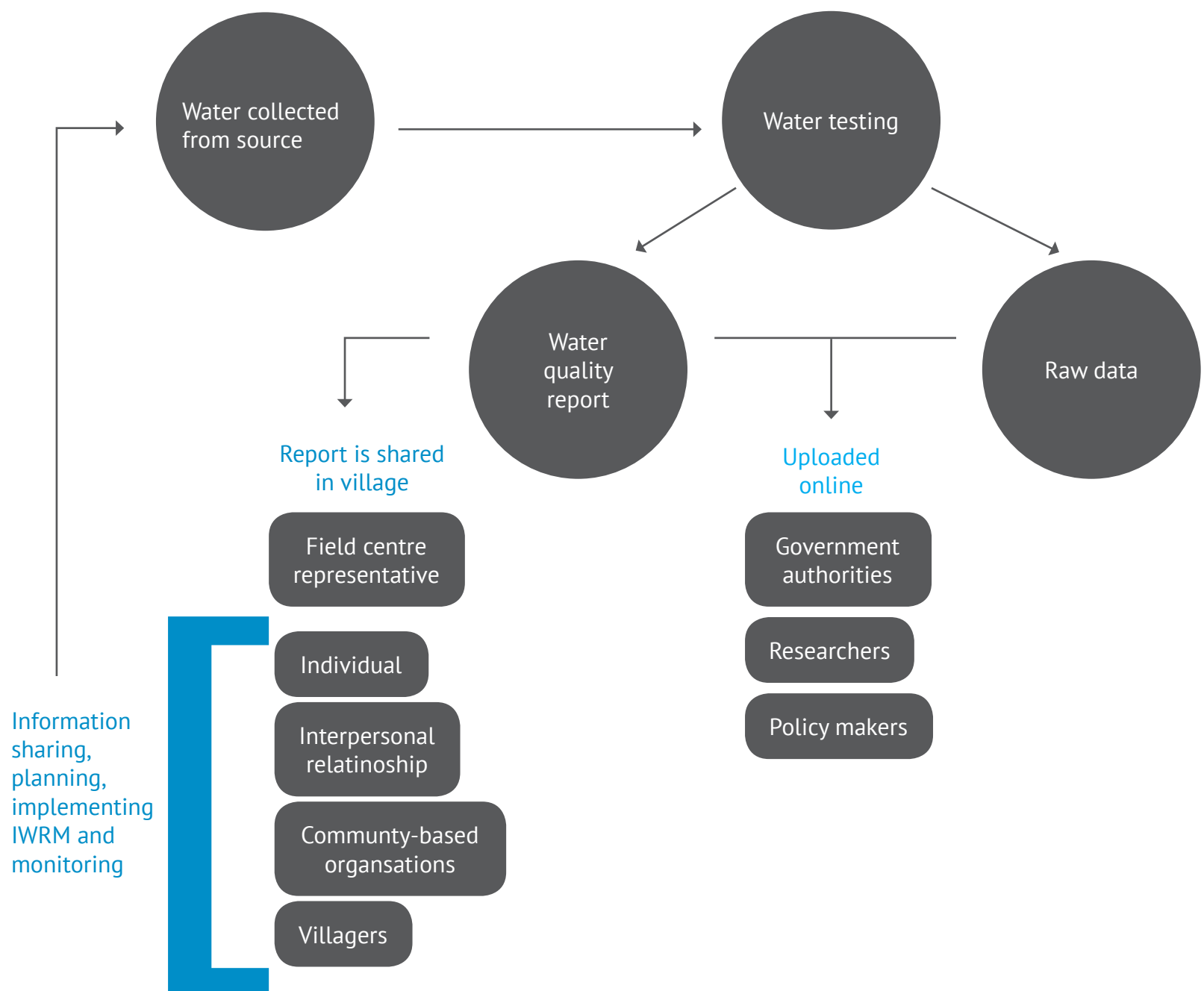

Figure 4: Visualisation of information flows in Neerjaal

4. CONCLUSION & RECOMMENDATION

The Neerjaal project focuses on collecting high-frequency, quality data on key dimensions of water. This enables stronger and more systematic dissemination of data to augment government information and encourage community-led evidence-based decision making in the conservation and management of water resources. These activities will be crucial for achieving the Sustainable Development Goals in the era of the post-2015 development agenda.

The findings of this paper provide a healthy spring-board for developing a future research agenda. The overriding conclusion that can be reached is that a holistic and integrated approach is needed, bringing together different disciplines of water and environmental management, biophysical and social sciences and ICT for development. Opportunities for innovative research, which straddle all these disciplines to gain new insights into how better coping and adaptation strategies that incorporate learning loops and knowledge sharing, can be developed for vulnerable communities facing water stress.

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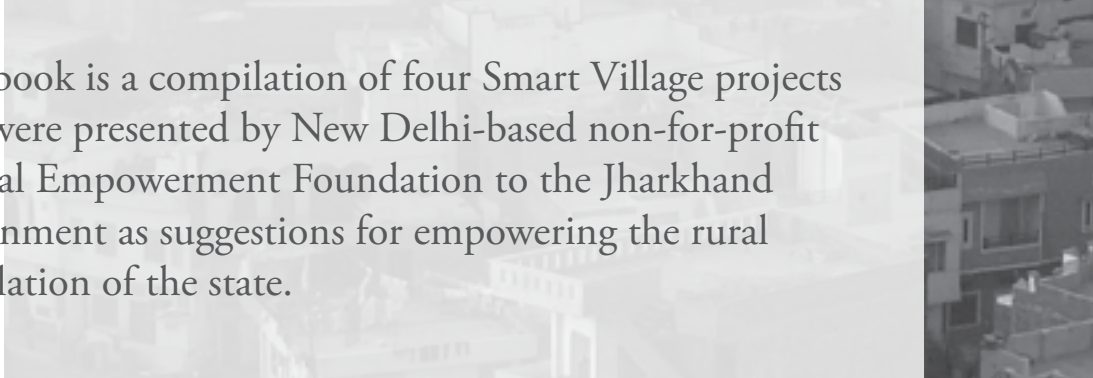
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RAJAT KUMAR

Rajat Kumar is an Officer (Research and Advocacy) at DEF. A tea aficionado and incorrigible nerd, he identifies himself as a child of the Internet and would probably have a panic attack if his devices failed him. Rajat's passion is understanding real world social networks and interactions using the tools of social and data science. His favourite quote is: "Do not take life too seriously. You will never get out of it alive" - Elbert Hubbar.

This book is a compilation of four Smart Village projects that were presented by New Delhi-based non-for-profit Digital Empowerment Foundation to the Jharkhand government as suggestions for empowering the rural population of the state.