

Background Notes

5th IFIP World IT Forum

April 16-18, 2012, Vigyan Bhawan, New Delhi



Department of Information Technology,
Ministry of Communications and Information Technology
Government of India





AGRICULTURE

04 ICT for Sustainable Human Development Agriculture

EDUCATION

14 ICT and Education

HEALTH

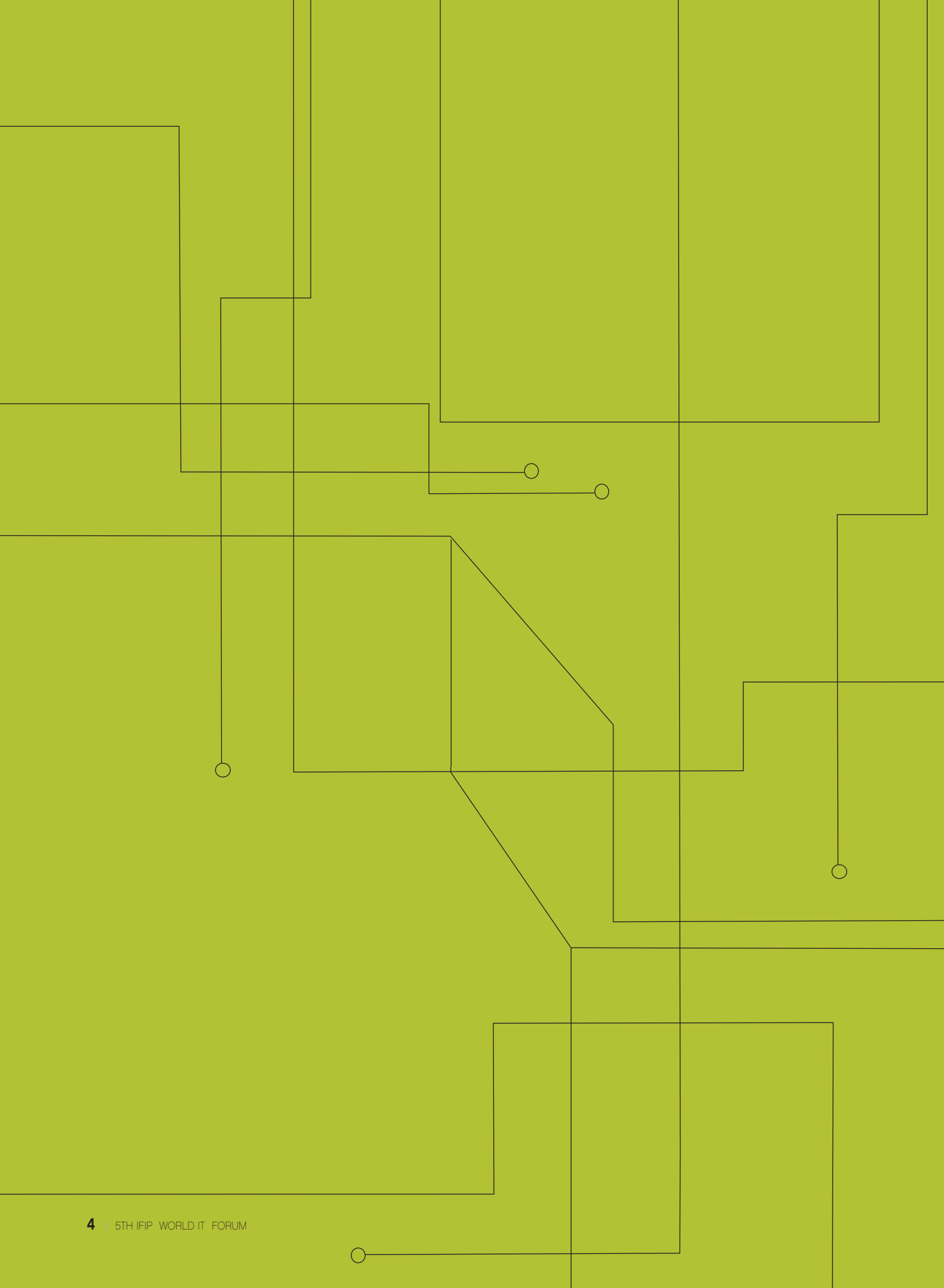
24 ICT and Health

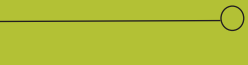
E-GOVERNANCE

34 E-Governance



Contents





Agriculture

ICT FOR SUSTAINABLE DEVELOPMENT IN AGRICULTURE

Agriculture produces three key outputs for developing countries: food, employment, and trade (domestic and international). These outputs contribute directly to national development goals of ensuring food security, ending poverty and fueling economic growth. No economy can pursue a strong and independent national development strategy without taking care of the agriculture sector and the people dependent on it.

Agriculture remains an important sector in the economies of almost all developing countries. Its contribution to GDP has actually declined significantly in recent decades in a number of countries, particularly in East and Southeast Asia. However, it remains a principal source of employment for the rural population and a major earner of foreign exchange for the economies of these countries.

Agricultural production in some of these countries is generally characterised by the predominance of small farmers whose landholdings are often fragmented and average less than one hectare in size. They often fall below the poverty line and therefore have very little resources to sustain their farming operation without external assistance. Cultivation is also dependent on the uncertainties of variable rainfall and average output is generally low.

Value addition in agriculture requires technological, institutional and price incentive changes designed to raise the productivity of the small farms.

Agriculture: A neglected sector?

Despite the continuing dependence on agriculture for a majority of people in emerging economies, we are witnessing a decline in attention and investment (for example, on research and development, infrastructure, appropriate technologies, communication and extension) in the agricultural sector. Farmers, farm workers and artisans who depend on agriculture often remain poorer than those working in other sectors of the economy. Massive migration continues from rural to urban areas, as rural areas remain under-developed and lacking in opportunities, especially for youths.

Agriculture in emerging economies often remains at the mercy of fundamental factors including poor quality of weather information, lack of access to capital, improved seeds and technology, unavailability of land records, and now the increasing threat of climate change. Any discussion on sustainable national and human development must put the focus back on rural and agriculture development, as key building blocks of national progress.

Winds of change

The global agriculture scenario has undergone significant changes, especially in the past decade. Some of these changes stem from the emergence of the WTO, the introduction of new technologies with the potential to enhance crop productivity, and the increasing movement of labour from agriculture to other sectors of the economy. In order to take full advantage of the changing global agricultural scenario, we need to review the connections between public

policies and the pricing, marketing and trading of agricultural commodities. At the same time, there is a need to review and revitalise the mechanism for transfer of technology, especially to enable developing countries to take rapid strides towards increased agricultural productivity.

A new paradigm of agricultural development is fast emerging in both the developed world and emerging economies, especially in the latter, where the overall development of rural areas is expanding in new directions. Old ways of delivering important services to citizens are being challenged and traditional societies are gradually moving towards becoming knowledge societies all over the world.

Relevant and timely information is the key

Farmers urgently require timely and reliable inputs for taking informed decisions. At present, a majority of farmers depend on the trickling down of decision inputs from conventional sources, which are often slow and unreliable. The changing environment faced by farmers makes information not just useful, but critical, to remain competitive.

It is readily accepted that greater information flow has a positive effect on the agricultural sector and individual stakeholders. However, collecting and disseminating information is often difficult and costly. ICT offers the ability to increase the amount of information provided to all participants in the agricultural sector, and helps speed up sharing of the same with a broader audience while bringing down the cost of disseminating such information. An understanding of the factors associated with IT adoption and use in agriculture can enable the development of strategies to promote IT adoption and increase the effectiveness and efficiency of the shared information.

It is an equally well-known fact that access to information holds the key for viable socio-economic

development. However, rural populations in most countries still face challenges in accessing and utilising crucial information to make timely decisions for better farming. IT is creating newer possibilities every day to find solutions that can help different categories of end users. For this purpose, a robust electronic communications infrastructure needs to be established for remote areas. The challenge is not only to improve the accessibility of information and

when combined, may be shared more widely. Digital libraries can be created to integrate widely scattered references to Indigenous Technical Knowledge (ITK) systems in an easily retrievable form, to act as a bridge between traditional and modern knowledge systems.

In the context of agriculture, the potential of information technology can be assessed broadly under two heads: (a) as a tool for direct contribution to agricultural productivity; and (b) as an indirect tool for empowering farmers to take informed and quality decisions, which will have a positive impact on the way agriculture and allied activities are conducted.

New technologies can help bring better information services to rural areas. In this way, farmers, as users, can have much greater control than before over current information channels, to make informed choices

communications technology (ICT) to agrarian populations; but also to improve the relevance of information aimed at fostering local development.

Shared knowledge networks

There is an imperative for such information to be up-to-date while being relevant and applicable to both small and large farmers' needs. Empowered with pertinent and timely knowledge, small-scale producers can gain a competitive edge over larger operations. Also, when the same knowledge is harnessed by strong organisations of small producers, strategic planning can be used to provide members with least-cost inputs, better storage facilities, improved transportation links and collective negotiations with buyers.

For example, ICT can also help document both organic and traditional cultivation practices, which,

ICT and agricultural extension services

ICT can give a fresh impetus to the organisations working to enhance the productivity levels in agriculture, which, if nurtured effectively, could become transformational factors. The 'knowledge' itself can become a driving force for overall agricultural development. Agricultural extension, in a rapidly-changing world, has been recognised as an essential mechanism for delivering information and advice as an input for modern farming. However it has to escape from the narrow mindset of transferring technology packages alone to transferring knowledge or information packages.

IT-enabled agricultural extension, in turn, has the potential to become more diversified, knowledge-intensive and demand driven and, thus more effective in meeting farmers' information needs. New technologies can help bring new information services to rural areas where farmers, as users, can have much greater control than before over current information channels. Broad basing agricultural extension activities, developing better research and having location-specific modules for the same – while simultaneously promoting market extension

for sustainable agricultural development through participatory research – are some of the areas where ICT can play an important role.

For example, research shows that the delivery of goods is effective when a grass roots extension worker covers a small area of jurisdiction, with multiple purposes (broad basing). Often, existing systems with large jurisdictions, and a limited range of activities, are less effective. This is where ICT can also help empower grassroots workers to gather, store, retrieve and disseminate a broad range of readily-available information needed by farmers, thus transforming them from extension workers into knowledge workers.

Precision farming, popular in developed countries, extensively uses IT to make a direct contribution to agricultural productivity. A combination of techniques, like remote sensing using satellite technologies, geographical information systems (GIS), agronomy and soil sciences are used to increase agricultural output. This approach is capital intensive and useful where large tracts of land are involved. Consequently, it is often more suitable for large, corporate-run farming.

The indirect benefits of IT in empowering farmers are far more significant and remain to be exploited, especially in emerging economies.

Informed choices

Information and communication technology will be able to provide answers to a number of questions to the farmers. For example, what are the benefits of more or less irrigation? When is it most cost-effective, or beneficial, to apply additional fertilizers and chemicals? When is the best time to sell crops or buy inputs? With improved record-keeping, a more detailed cost-benefit analysis and sophisticated marketing strategies, farmers can make better decisions and earn higher profits.

Farmers, agricultural researchers, cooperatives, suppliers and buyers can use the internet and social media tools to exchange ideas and information and conduct business with each other. Machinery, seeds, chemicals and other types of agricultural products can be purchased and sold online. IT can help provide timely information on the likely price distribution of key commodities over the coming years. Such information helps farmers and traders make decisions on when, and in what ways, to market their crops.

In fertilizer marketing alone, IT can play a major role in efficient sales operations, checking the marketing costs, safeguarding market share and providing efficient customer services. A well-conceived IT setup can endow decision makers at all levels with better systems to effectively respond to rapidly changing market conditions.

In order to encourage farmers to obtain the best possible price, information on various agricultural output markets can also be provided. The objective of this activity is to provide the status of price at different markets to facilitate farmers move their produce to the markets where they can expect the best price. Weather information provided in a timely manner can also assist the farmers in their planting and harvesting decisions.

The contribution of information technology in bringing down costs, increasing efficiency and improving productivity ultimately boosts the bottom line, leading to a better quality of life in a profession that still employs large numbers in countries like India and in large swathes of Africa and Asia.

Broadly, some of the benefits are:

- Enhancing agricultural production, improving market connect
- Capacity-building and empowerment

through ICT that can all enhance the livelihood of farmers

- Online services for information, education, training, monitoring and consultation, as well as transaction and processing

- E-commerce for direct linkages between local producers, traders, retailers and suppliers

- Facilitating interaction among researchers, extension (knowledge) workers, and farmers

- Question-and-answer services where experts respond to queries on specialised subjects

- ICT services to local officials for greater efficiency in delivering services for overall agricultural development

- Up-to-date information, supplied to farmers as early as possible, about subjects such as packages of best practices, market information, weather forecasting, input supplies, credit availability, etc.

- Creation of databases with details of the resources of local villages and villagers, site-specific information systems, expert systems, etc.

- Provision of early warning systems about diseases and pests

- Information regarding rural development programmes and crop insurance, post-harvest technology, etc.

- Facilitation of land records and online registration services

- Improved marketing of products with a short shelf life, like milk and milk products

- Providing information to farmers regarding farm business and management

- Increased efficiency and productivity of cooperative societies through the computer communication network and the latest database technology

- Tele-education for farmers

- Interactive websites established by agricultural research institutes, that can make the latest information available to extension (knowledge) workers

- Obtaining feedback to improve all of the above

Some examples:

The Warana Wired Village project -India

The Warana cooperative complex in the Indian state of Maharashtra has become famous as a fore-runner of successful integrated rural development emerging from the cooperative movement. Warana Nagar has an electronic telephone exchange, connecting nearly 50 villages, where about 80 percent of the population is dependent on agriculture.

An independent agricultural development department was established by the cooperative society. The project was initiated with six business centres, six IT centres and 70 village booths (kiosks) – aimed at providing a vast array of services, from agricultural, medical and educational information, to bringing the world's knowledge to the villagers' doorsteps through the internet via the National Informatics Centre Network (NICNET), and establishing a geographical information system (GIS), as well as information on employment, agricultural schemes and government procedures.

Also available are: automated assistance in completing applications for government documents such as ration cards, birth and death certificates; crop information; bus and railway timetables; water supply details; agricultural marketing information; educational and vocational information. The land records application permits villagers to view and print extracts using data from a large database stored on a compact disc, or from the website of the tehsil (a sub-division of a district concerned with tax revenues) to which they belong.

e-Choupals- India

E Choupal was started in 2000 by the India Tobacco Company (ITC) and involved the setting up of a large

number of village Internet kiosks, or 'e Choupals', in the Indian state of Madhya Pradesh, initially. E Choupals directly link rural farmers via the Internet for procurement of agricultural and aquaculture products like soybeans, wheat, coffee, and seafood. It now reaches ten Indian states, and touches the lives of over 4 million farmers. The e Choupals are run by local entrepreneurs and provide futures' price information to farmers, in local languages, enabling them to sell their produce directly to ITC, bypassing the middlemen and wholesale markets. The programme involves the installation of computers with Internet access in rural areas of India to offer farmers up-to-date marketing and agricultural information.

The Pachamama Coffee Cooperative – USA

A cooperative of small-scale coffee producers ("Pacha") is a California-based federated cooperative, 100 percent owned and governed by more than 140,000 small-scale coffee farmers in the developing world. Their organic coffee is produced in unique microclimates by member-owners, shipped to the USA, hand-roasted in small batches, branded, and delivered straight to customers. Employing the latest mobile technologies, Pacha is leading the way for future generations with initiatives like www.TraceableCoffee.org and www.CoffeeCSA.org. These technologies and the ownership model are scalable and can be easily replicated for other valuable consumer products, such as rice, tea, cocoa, artisan crafts and more.

Woreda Knowledge Centers – Ethiopia

The International Live Stock Research Institute (ILRI) project initiated ten ICT-based Woreda Knowledge Centers (WKC) in four regions of Ethiopia, namely, Amhara, Oromia, SNNPS, and Tigray to promote the productivity of farmers starting from 2005. These WKC are expected to provide the local farmers with reliable, relevant, and timely agricul-

tural knowledge and information, which can help the local farmers become more efficient and effective in agricultural production.

The application of knowledge management systems in agriculture is a good platform, which can be used for creating knowledge repositories, improving access to sharing of the same through collaboration, while creating knowledge assets. As a result, farming processes can be made more effi-

Traditional and modern methods of cultivation which, when combined, may be shared more widely. Digital libraries can be created to integrate such knowledge in an easily retrievable format at the click of a button

cient and timely, ensuring higher quality of output and increased productivity. In this process, ICT can be a significant enabler by facilitating access to knowledge repositories.

Kenya Agricultural Commodity Exchange

Kenya Agricultural Commodity Exchange (KACE) is a Kenyan micro, small and medium enterprise (MSME) that provides a forum through which small-scale farmers can access mainstream markets for a variety of agricultural commodities like maize and beans. As an intermediary, KACE further empowers rural farmers with market information and helps with capacity enhancement, business training and technical assistance.

The main activities of KACE include linking farmers and mainstream buyers by collecting information on commodity prices in different markets on a

daily basis from market vendors, and making them available to farmers in real time, through mobile phone handsets and personal computers, where trades are made through competitive bids and offers. It also acts as a clearing house, giving farmers more options as well as bargaining power. KACE's services include: mobile-based short message service (SMS), interactive voice response (IVR), daily radio bulletins, a live radio auction and online computer services.

KACE reaches millions of small-scale farmers in Kenya and neighbouring countries, such as Uganda and Tanzania. Mainstream buyers such as manufacturers, cooperatives, wholesalers, and exporters have also benefited through increased availability at a fair price. Consumers ultimately gain through increased availability, better quality and reduced transaction costs.

Nokia Life Services - India

Nokia's Life Tools service provides information to India's farmers and farming communities. It uses SMS text-messaging technology on mobile phones to provide farmers with current information on weather, advice about crop cycles, general farming tips and techniques, and market prices for crops, seeds and fertilizers. Information is delivered in the recipient's preferred language. Nokia tapped into an extensive array of partners, including information service provider Thomson Reuters, agricultural domain expert Syngenta, weather expert Skymet and leading telecom carriers Bharti Airtel, Idea Cellular, Reliance Communications and Tata DOCOMO. Besides agriculture, health and education are also focus areas, and Nokia Life Services, launched first in India, now has over 50million users including in China, Indonesia and Nigeria.

IFFCO Kisan Sanchar Ltd (IKSL) - India

M-Powering Farmers is a partnership between

the world's largest farmers cooperative, the Indian Farmers Fertiliser Cooperative Limited (IFFCO) and India's leading telecom provider Bharti Airtel, to address the lack of timely agricultural information available to farmers in India. Together they formed IFFCO Kisan Sanchar Ltd (IKSL) and launched M-Powering Farmers to provide agricultural information to farmers via mobile phones, using innovative voice-based technology to deliver the information to the farmers in their local language, including a local support line. IKSL sends farmers daily information on farming techniques, weather forecasts, input availability, etc., to improve their operations. It has a clientele of over 11 million farmers, with many reporting significant increases in farm productivity, resulting in the increased availability of food and higher income generation. In addition rural entrepreneurs have been employed by IKSL as ambassadors.

Critical questions and areas for intervention

Increasing agriculture productivity, ensuring food security and trade are a key priority for most developing countries. Nevertheless agriculture sector remains constrained by issues of access to land, capital, markets, knowledge, appropriate technologies, and immense institutional weaknesses. *Can information technology, which is bringing enormous changes around us, transform the agriculture sector? Is there real hunger for information technology in agriculture?*

GDP growth from agriculture benefits the incomes of poor people two to four times more than GDP growth in other sectors of the economy. Thus nations have a responsibility to ensure the welfare of agrarian and rural communities and to ensure that farming continues to be a viable and profitable livelihoods opportunity for millions of households engaged in it. *Can IT make this happen and transform agriculture into an attractive livelihoods opportunity for all?*

The sector is littered with hundreds of IT

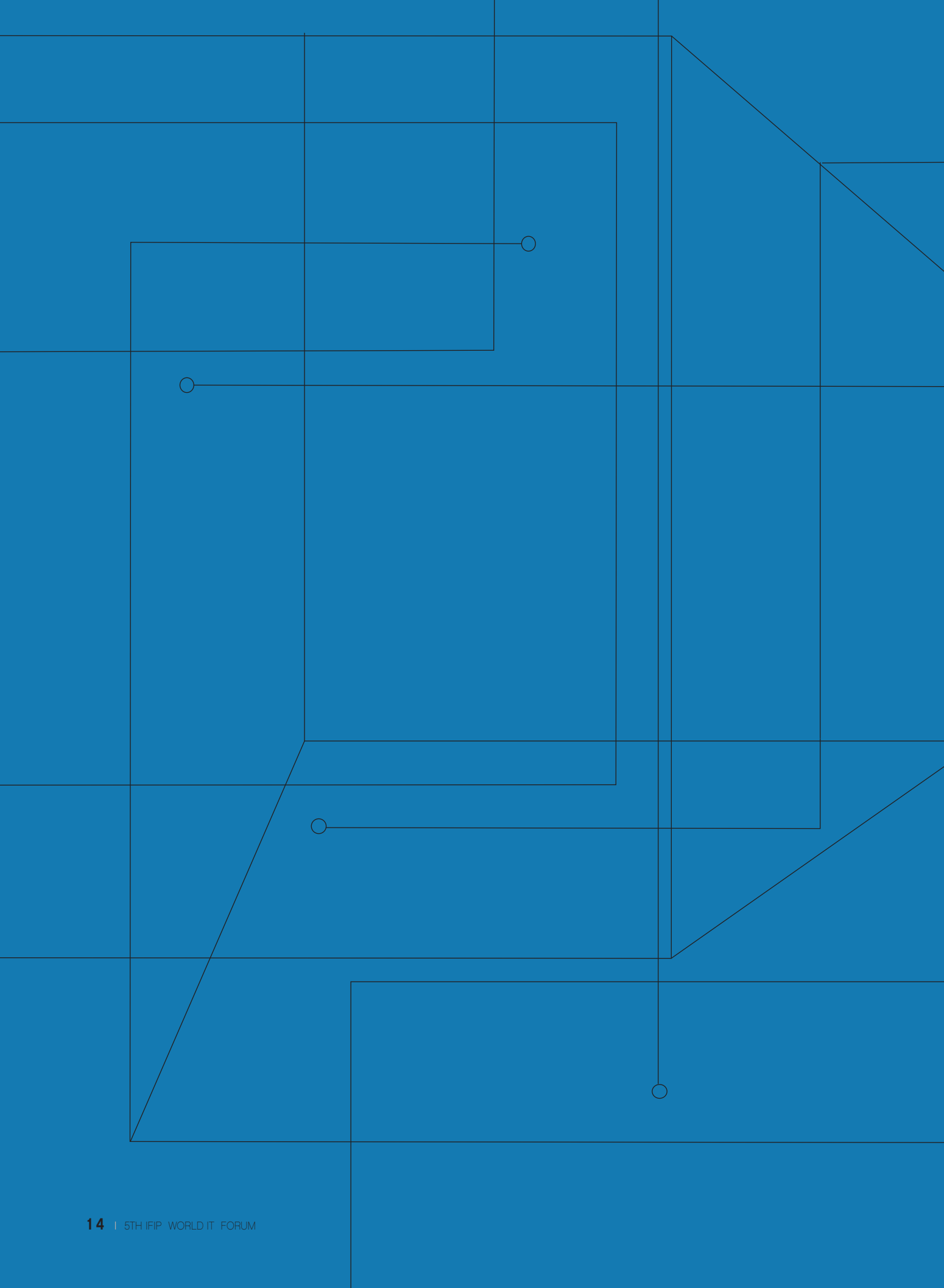
projects, which started as pilots and were heralded as ‘the next big thing’ in agriculture development. But most disappeared once the funding or interest dried up, often failing to scale up or have a lasting impact. There is a need to constantly assess the impact and sustainability of ICT-enabled interventions. *Are there any lessons? How do we scale up and sustain ICT for agriculture projects? Will the pilots ever fly?*

Mobile devices, buttressed by the growing penetration rates of wireless connections, affordability and ease of use, are emerging as crucial platforms for the delivery of both information and public services. Though there is increasing realisation that ICT can be used to offer low-cost solutions it remains, at best, an enabler. *What is the future of ICTs in agriculture in developing countries? Can mobile devices and newer applications transform agriculture and enhance the livelihoods of farmers?*

Low literacy levels and consequent language barriers, as most of the application software is predominantly in English, high cost of computers and associated expenditure, poor communications infrastructure and low broadband connectivity in rural areas make it impossible for individual farmers, particularly small landholders, to directly adopt IT. Vernacular language fonts and mechanisms for synchronisation of the content provide a challenge that needs to be met with careful planning. On the other hand, another major hindrance is making people in rural areas comfortable with new technologies.

In most of the rural areas (especially in a country like India), power supply is not available for long hours. This reduces the utility of the intended services, preventing well-meaning schemes from reaching the intended beneficiaries. Despite the phenomenal progress made in recent years, broadband connectivity to rural areas still needs improvement, in a country like India where mobile connections far outstrip broadband users. Reliable connectivity is a prerequisite for the successful penetration and optimum utilisation of IT resources in rural areas.

It is with this background that the WITFOR Agriculture Commission aims to assess the role that ICT can play in the agriculture sector. Moving away from the rhetoric on the benefits of ICT, it wishes to address certain fundamental questions that require intervention at various levels.



The background is a solid blue color. On the left side, there are several white geometric lines forming a stepped, staircase-like pattern that ascends from the bottom left towards the center. A horizontal line extends from the left edge towards the right, ending in a small white circle. Another vertical line runs parallel to the left edge, intersecting the horizontal line. A diagonal line also descends from the top left towards the center, intersecting the horizontal line.

Education

ICT AND EDUCATION

The education sector is crucial for developing the human capital of countries, and for finding innovative solutions for sustained and equitable growth. At the individual level, a good education is an 'enabling' factor, empowering people to sustain themselves economically, and influence their socio-political environments.

Most of the emerging economies are characterised by rapidly-growing, young populations. Some, like India, have low literacy levels, combined with high drop-out rates in schools. The cost of education is often too high for children to continue with their studies after a certain point. Yet, governments give low priority to education, which has resulted in limited educational facilities and a shortage of qualified teachers in most developing countries. However, in order to contribute significantly to the global

economy, build on human capital and ensure sustainable national development, every country needs a vibrant education system.

In the case of India, for example, its unique demographic dividend needs to be leveraged properly for the country to benefit economically and socially. As the number of children and youth in the population increases, there is an imperative to provide education, training and skills to this diverse, multi-lingual, and socio-economically diverse population. Given the varying degrees of access to education

and training, technology can play a crucial role in enabling access, providing training and generating continuous feedback and improvement.

In 2000, the international community agreed to the Millennium Development Goals (MDGs) that aim to significantly reduce global poverty, hunger and inequality by 2015. Education receives special attention in MDG-2, with its focus on enhancing primary education in terms of quality and access.

Many exciting applications of information and communications technology (ICT) in schools validate that new technology-based models of teaching and learning have the power to dramatically improve educational outcomes. ICT can be used to improve the quality of education by enhancing educational content development, supporting administrative processes in schools and other educational establishments, and providing greater access to education for both teachers and pupils via distance learning. It offers opportunities for students and young people, particularly those living in rural communities, to broaden their horizons and improve their employment prospects.

Technology also spells the “death of distance” and allows students and instructors from distant areas to access learning materials and lessons in easily usable formats. Thus, technology truly allows for expansion of opportunity and access, while helping bridge the skills gap. Also, ICT enables the building of a conducive environment through the application of innovation in management and administration.

Key challenges in developing countries

- Ensuring sufficient enrollment and continuous attendance and participation of students

- Enabling learning via active teacher participation and attendance

- Ensuring that education and training enables students to take up employment

- Building an ecosystem that opens up access to educational opportunities to all citizens, regardless of economic situation or distance

The role of ICT

- Information and communication technologies can play an important role in addressing key gaps in physical infrastructure

- Make the learning process interesting via the application of new tools, which would encourage higher enrollment in classrooms nationwide

- Use technology to monitor teacher attendance and presence in the classroom, thereby incentivising their attendance and reducing instances of teacher absenteeism

- Technology that can help students become aware of the latest trends in their chosen areas of study, and narrow the gap they may otherwise face in their knowledge or quest for a job

What's required?

- To address the challenge of limited infrastructure and capacity building

- Enable teachers with limited exposure to technology to obtain skills that enable them to use new technology-based models of teaching and learning

- Encourage and convince local communities that new, technology-based models of teaching and learning are better than current instructional approaches

- Leverage educational technology to increase equity rather than widen current gaps between the “haves” and “have-nots”

- Enhance the quality of teachers and instructors and develop a critical mass of knowledge workers

- Improve the learning process by provision of more interactive educational materials

Planning for ICT in education

Attempts to enhance and reform education with the help of ICT requires clear and specific objectives, guidelines and time-bound targets, the mobilisation of required resources, and the political commitment at all levels to see new initiatives through. First off, a rigorous analysis of the existing state of the educational system is required. ICT-based interventions must take into account current institutional practices and arrangements, as well as traditional learning systems, which need to be built into any such planning. Specifically, drivers and barriers to ICT use need to be identified, including those related to curriculum and pedagogy, infrastructure, capacity-building, language and content, and financing.

Clarity in identifying goals and challenges

The specification of educational goals at different education and training levels, as well as the different modalities of the use of ICT, need to be clearly defined, which can best be optimally employed in pursuit of these goals. This requires policymakers to have an understanding of the potentials of different ICT applications – and their limitations – when applied in different contexts and for different purposes.

Also required is an awareness of priority education needs, financial and human resource capacity and constraints within the country or locality, as well as knowledge of best practices around the

world and how these practices can be adapted for specific country requirements. Also, students in higher education institutions are geographically dispersed and come from different age groups and backgrounds.

The role of pilot projects

There is, further, a need to identify stakeholders and to harmonise efforts across different interest groups. Then the piloting of carefully-selected ICT-based models has to be undertaken, as even the best-designed models or those that have already been proven to work in other contexts need to be tested on a small scale. Such pilots are essential for identifying and correcting potential glitches in instructional design, implementation and effectiveness, especially in countries, like India, with large populations. Only then can existing sources of financing, and development of relevant strategies for generating additional financial resources to support ICT use over the long term, be deployed.

Dealing with manpower constraints

An important activity in distance education is to provide student support services, an area that is often neglected. When student enrolment increases, it is the first section that needs to be scaled up in terms of staff number and capacity. Hiring trained staff to handle student enquiries is not an easy task in diverse countries like India, especially in education, as mid-level personnel can find high paying jobs in the growing information technology (IT) sector. Faced with new training demands and new competitive challenges, many institutions need to undertake profound changes in terms of governance, organisational structure and modes of operation.

ICT and access to education in remote areas

ICT can dramatically enhance the access to education, cutting across national boundaries. In most of the developing countries where a large number of people live in rural areas, ICT can play a very important role in reaching out to people who have hitherto had little or no access to a formal education. For example, in India's villages, there are often no formal schools and, even if they do exist, they do not have the proper infrastructure or manpower in place. In many cases, the teachers that are there are not well trained or skilled enough to teach. Hence, distance learning can provide access to good quality education for children in these areas.

Continual skills upgradation through open and distance learning

Open and distance learning is one of the most rapidly growing fields of education, and its potential impact on all education delivery systems has been greatly accentuated through the development of Internet-based technologies. Open and distance learning provides increased access and flexibility, and offers exciting combinations of work and education.

As a force contributing to social and economic development, distance education is fast becoming an accepted and indispensable part of mainstream educational systems in both the developed and developing countries. This growth has been stimulated, in part, by the interest among educators and trainers in the use of new, Internet-based and multimedia technologies. This is also bolstered by the recognition that traditional ways of organising education need to be reinforced by innovative methods, if the fundamen-

tal right of all to education, is to be realised. Age barriers, as well as distances, can be transcended, helping bring larger populations into the fold.

The globalisation of education further provides many opportunities for emerging economies for the realisation of their system-wide goals. Two main factors have led to an explosion of interest in distance learning: the growing need for continual skills upgradation and retraining; and the technological advances that have made it possible to teach more and more subjects even across great distances.

In most of the developing countries where a large number of people live in rural areas, ICT can play a very important role in reaching out to people who have hitherto had little or no access to a formal education

More and more traditional universities are rapidly transforming themselves from single mode to dual mode universities, recognising the importance of distance education in providing students access to the best and most up-to-date educational resources, in addition to traditional teaching methods. The increasing number of open universities established across the world is but one indication of this trend. This can be ably bolstered by the digitisation of content, with a growing focus on interactive methods of learning, and a move to provide content in multiple, even vernacular, languages.

Digital content and its benefits

E-content is digital information delivered over network-based electronic devices. It is a subcategory of

both digital and electronic content, marked by the involvement of a network, which leads to a constant renewal of content (contrary to the fixed set of content stored on a carrier such as a CD-ROM, or the content broadcast via TV and Radio). This constant renewal of content in tune with the dynamic changes in technology, allows both students and teachers to keep pace with the latest curricula.

Digital content is more diverse than traditional paper-based content; it may include print materials with digital supplements, digital tools with print support, or standalone digital tools. Besides placing large quantities of content within easy reach, often at the click of a button, it helps improve the learning

Relevant and timely content selection systems can make it easy for teachers to find the 'best' material or lesson for a particular student or class, or to create their own

process by providing more interactive education materials to generate greater interest and consequently improve learning skills. Not only does it help students, it also leads to better management and administration, while placing vast quantities of learning material within easy reach of trainers and teachers alike. This can further help in developing a critical mass of knowledge workers.

Content digitisation improves access for people in rural/ remote areas. It helps in better lesson planning, through relevant and timely content selection systems that can make it easy for teachers to find the 'best' content or lesson for a particular student or class, or to create their own, new material. Algorithm-driven recommendation engines can be put to use as they sug-

gest content for teachers to use, based on student inputs. Also, adaptive software can be used, which enables students to move at the optimal or required pace and rigour.

Some examples:

SIF ICT in Education Project (Bhutan)

The Singapore International Foundation (SIF) ICT in Education project, initiated in 2000, aimed to assist Bhutan's Ministry of Health and Education to introduce ICT into its education system. This was to help bridge the gap between the low ICT-skills among the future workforce and the growing adoption of ICT technology in the workplace. The project, conducted by the SIF Specialist IT team, also trained teacher educators and curriculum design specialists to utilise ICT in their work and to integrate computer-based training materials into the school curriculum.

Funding for the project was obtained from the Singapore government and philanthropic foundations in Singapore. Phase One of the project (2001 – 2002) dealt with ICT- literacy training and course development, which was designed to equip all Bhutanese teachers with ICT skills and to help them to prepare instructional materials.

Phase Two (2002 – 2007) helped develop the curriculum and launch a new elective ICT subject within the Bachelor of Education programme. This IT curriculum would achieve two goals. First, equip the trainees with sufficient skills to teach computer studies in middle and high schools. Second, provide trainees with the skills required to design and develop teaching materials and to teach using ICT.

Singapore Polytechnic Virtual College

The Singapore Polytechnic Virtual College relies on Intranet/Internet technology to deliver its programmes. The Virtual College operates and admin-

isters a large collection of interactive, online learning modules. It promotes flexible learning where students can log on to the Polytechnic networks from a computer, on- or off-campus, using the Internet. The virtual college caters to two sets of learners: working professionals and on-campus students. By using the Internet, working professionals can re-train themselves in different areas whenever they feel the need to do so.

On-campus students can use the Virtual College as a resource to supplement the conventional learning environment. They can use online materials to reinforce concepts and retrieve lecture information that they may have missed. The Virtual College online materials consist of seven components: For Your Information, Lecture, Tutorial, Assignment, Virtual Laboratory, Digital Resources, and Assessment Centre.

Symbiosis Centre for Distance Learning, India

The Symbiosis Centre for Distance Learning (SCDL) is a private distance education provider offering mainly postgraduate programmes in various disciplines including management, information technology, education, humanities and law. All SCDL centers are connected through a virtual private network. All activities and operations are carried out mainly in a centralised fashion using innovative ICT solutions. It offers blended learning programmes combining self-learning material (SLM), e-learning, online learning and faculty-based learning.

The institute experienced exponential growth in student enrolment from about 8,000 students in 2001 to over 60,000 students in 2009. The active student strength of SCDL during 2009-2010 was approximately 210,000. Due to this sudden growth, the institute faced various challenges, such as managing a huge student base without losing its focus on quality and student satisfaction. Increasing

its manpower and administrative costs would not have guaranteed efficiency in managing the large student enrolment. After careful consideration, the Institute decided to rely on innovative and cost-effective ICT based practices to resolve the problems.

They also used ICT to provide facilities like: Asynchronous learning aids, E-learning courseware, Pre-recorded lectures on DVDs, Online assignments, On-demand examinations etc.

Programme Planning in Adult Education-Canada

Programme Planning in Adult Education is a three-credit Internet-based course designed for masters and doctoral students in training and vocational education

Digital libraries are a valuable supplement to the conventional learning environment. Students can use online materials to reinforce classroom learning and retrieve lectures that they may have missed

and Adult Education. This course is offered by Faculty of Education, University of Manitoba, Winnipeg, Canada. The course is delivered through the WebCT learning platform. The course's objective is the study and application of various theoretical foundations and models for planning education and training programmes for adult learners.

Its target audience includes researchers, administrators, policy-makers, consultants, teachers, industry trainers, human resource managers, workplace educators, and programme planners and developers. This course is delivered entirely on the Internet. Students are expected to commit to a minimum of 120 hours of independent study for

the course. Requirements include assignments that must be completed for grades as well as tasks that must be completed in lieu of attending classes, such as: sharing critical reflections on all assigned readings with instructor and peers, and initiating discussions and participating in discussions initiated by other students.

Khan Academy

It is the most famous nonprofit, online site of video tutorials, with a focus on school education, called K-12 (as per the American schooling system) and math and sciences. There are tools for students and teachers to track progress and develop a “map of knowledge”. It contains a large number of videos and practice exercises.

The Khan Academy started with its founder, Salman Khan, remotely tutoring family members using Yahoo Doodle images. Based on the initial feedback, others began to take advantage of the interactive, remote tutoring, leading to a switch to YouTube video tutorials. Focused on “providing a high quality education to anyone, anywhere”, the Academy has grown by leaps and bounds and now supplies a free online collection of more than 3,000 micro lectures via video tutorials stored on YouTube teaching mathematics, history, healthcare and medicine, finance, physics, chemistry, biology, astronomy, economics, cosmology, organic chemistry, American civics, art history, microeconomics and computer science.

It provides a web-based exercise system that generates problems for students based on skill level and performance. The project is largely funded by donations, and social media tools are used to disseminate information and provide access to tutorials. While all videos continue to be hosted on the Academy’s YouTube channel, they also are available through its website, which contains many other features such as progress tracking, practice exercises, and a variety of tools for teachers in public schools.

Critical questions and areas for intervention

Some of the problems that the application of ICT in education faces are:

- ▣ **Technical problems** – Low broadband penetration, low level of investments in production of learning and educational programs and materials; underdevelopment of user-friendly applications; risk-prone cultural and commercial attitudes in many societies toward technical innovations and applications; and lack of political and administrative support to redress the same

- ▣ **Pedagogical problems** – Reluctance of students to put in the desired extra work; increasing motivation levels; and changing the classroom learning mindset

- ▣ **Intellectual Property Rights issues** – Most of the graphics, diagrams, and video clips that module developers would like to use are copyright protected, along with the assignments and tutorial questions that are based on a textbook

- ▣ **Time consuming** – Online modules take time to develop, as well as significant technical expertise, leading to a huge investment of time and effort due to lack of experience and the need for constant support.

- ▣ **Training the teachers** – It is sometimes difficult to find tutors willing to adapt to newer technologies, in addition to their traditional workload. Also, online tutoring differs from normal face-to-face tutoring and thus requires additional training

- ▣ **Inadequate infrastructure** – costly equipment at institutions and their high vulnerability to technical problems leading to bigger maintenance costs

Making quality education accessible to all is a challenge no country can afford to ignore. Despite this imperative, manpower constraints, lack of student interest, high costs of building school infrastructure, the need to combine vocational training with class-

room education, and meeting the challenges of gainful employment often drive countries and education departments all over the world to seek new ways of engagement. *What impact can ICT-based interventions have on the overall quality of education?*

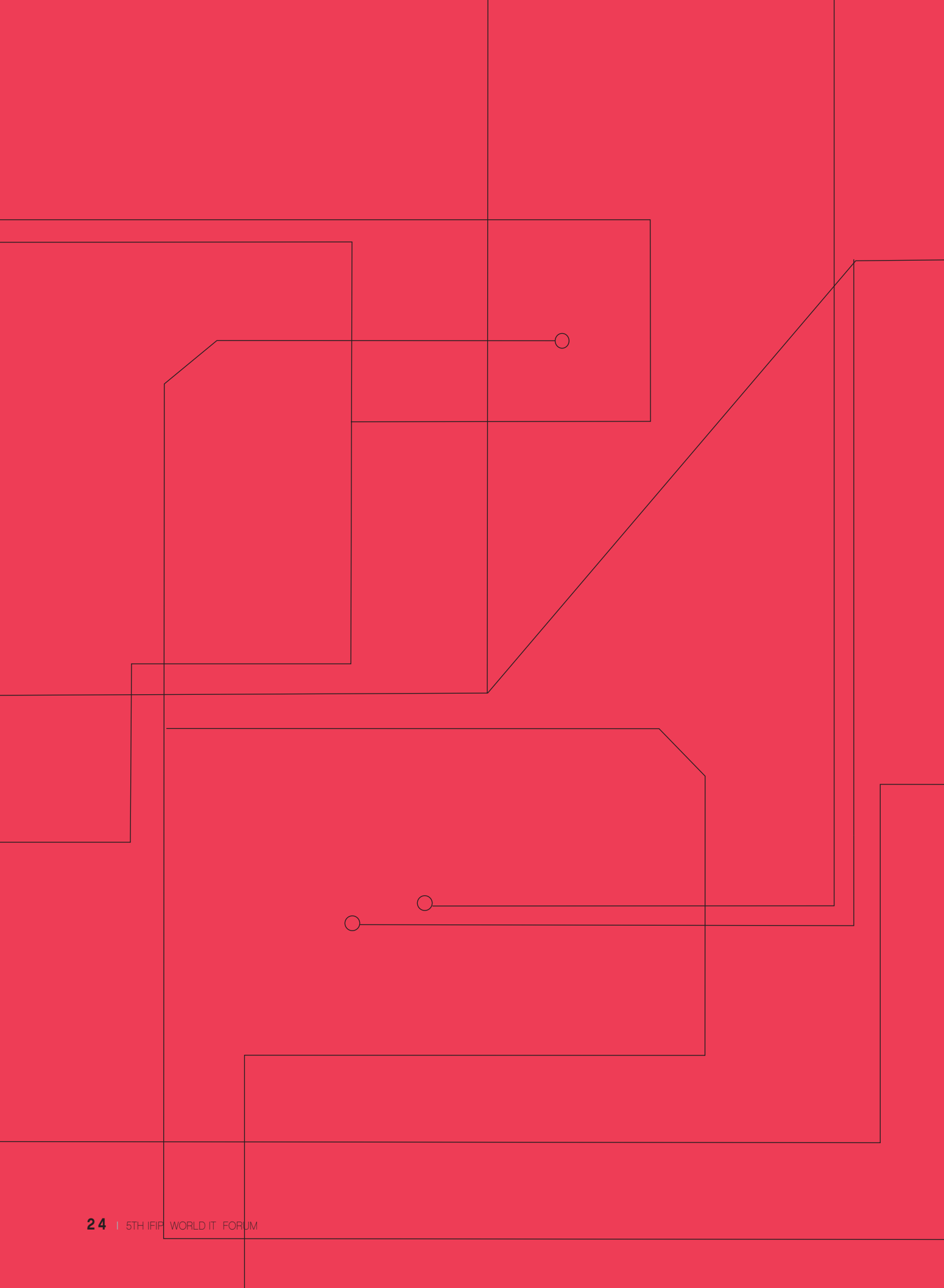
Countries and societies make continuous efforts to devise newer platforms for learning through effective and utility-based content structure and delivery. Education systems and institutions are being moulded to test the effectiveness and viability of new learning modules and best practices for multiple gains. For this, there is a continuous search for value-based content across all levels and institutions. Content structure, value and applicability are vital to effectively handling e-learning solutions and modules and for their broader use and sharing. *Can innovative and sustainable digitisation of content enhance classroom learning? What more needs to be done?*

While people continue to move across great distances for work, many workers are often dislocated, even as a significant number of young people are structurally unemployed or underemployed. Skills polarisation between the so-called 'knowledge' workers and 'unskilled' low-knowledge workers has widened the gap in income inequalities. While these changes have brought about considerable challenges that test the best of ideas on vocational training and skill upgradation, they have also created new opportunities for change and innovation. *How can ICT address these challenges? Can ICT equip trainers and job seekers alike to meet their goals of building an employable workforce and get gainful employment, respectively?*

Faced with new training demands and competitive challenges, many institutions need to undertake profound changes in terms of governance, organisational structure and modes of operation. A rising number of traditional universities are rapidly transforming themselves into multiple-mode centres of learning, recognising the importance of distance education, vocational training and the need to provide a potentially global workforce with the best

educational resources available, in addition to traditional teaching methods. The increasing number of open universities established across the world is highly indicative of this trend. *How can ICT be a force multiplier in open learning and improve the quality and effectiveness of distance education modules?*

These are some of the questions that the WITFOR Commission on Education seeks to answer, through active engagement with various stakeholders, especially policy-makers, via robust idea exchange. How can we convert small successes into dependable guidelines that can be suitably adapted by countries to meet their own, unique challenges? How do we address the broader challenge of emulating successes while adapting to change?





Health

ICT AND HEALTH

Health has an impact not just on the well-being of a person, but also on his or her socioeconomic status. Good health ensures that an individual's capabilities are optimised and that he or she has the basic freedom to achieve not just personal, but also the family's, social and economic needs. In most developing countries, the health sector's performance is often sub-optimal due to an increased burden of factors like underdevelopment, political instability, weak institutions, inadequately developed social sectors, scarcity of resources, and marked social inequalities.

ICT has the potential to impact almost every aspect of the health sector. In public health, information management and communication processes are pivotal, and are facilitated or limited by the availability of information. In addition, beyond the formal health sector, the ability of impoverished communities to access services and

demand a healthcare system that responds to their priorities and needs can be significantly influenced by broader information and communication processes, mediated by informed decision making.

ICT has the potential to transform healthcare, by efficiently connecting people and sharing information over distances. Properly implemented

IT can allow clinicians to have real-time access to complete patient data, and provide them with support to make the best possible decisions. It can help patients become more involved in their own care, which is especially important in managing chronic conditions like diabetes, asthma, or heart disease.

ICT can enable a wide range of individual - and community-level monitoring and real-time research such as the detection of developing epidemics, monitor health risks in the environment, or deal more quickly even with situations like adverse reactions caused by medication. It can improve clinical trials, and lead to more rapid advances in personalised medicine, while streamlining processes and reducing administrative overhead, as it has in other industries. It can further lead to the creation of new, high-tech markets and jobs.

Institutionalisation of ICT for better healthcare

The use of ICT has grown considerably in recent years and has triggered a great deal of interest in an age of rapidly-spreading epidemics that don't respect national boundaries, transforming the very nature of healthcare. Usage of ICT in healthcare is not only limited to healthcare facilities but also for support functions, such as administration and communication. It is beyond dispute that IT can transform the healthcare sector in more ways than one, but the failure of policies to keep pace with technological progress has meant that the benefits of ICT in healthcare often do not percolate down equally to all.

In India, for instance, e- governance has been institutionalised, via ways in which the use of ICT is becoming a norm for various government departments. Constant thinking about, and revision of, ICT policies have ensured that there is enough attention being given both to the benefits and challenges of the

use of ICT. Similarly, it is felt by many healthcare professionals that if the same is done for the health sector, it might help in enhancing the adoption of ICT in healthcare.

Building and managing a skilled workforce

The human resource (HR) crisis in health is widely acknowledged. At present, most government HR functions remain fragmented and within the health sector, these functions are often either the responsibility of clinicians who direct health facilities - and have little or no preparation in human resource management - or are the responsibility of 'personnel administrators' who have been trained to handle routine civil service policies and procedures.

There is an urgent need to professionalise this role and develop a cadre of well-trained HR managers, especially in large public sector health institutions, which often lag behind their private counterparts. This would include expanding both the number of HR managers and the organisational view of their role, as well as helping upgrade their skills. These changes would enable HR managers to be more effective in leading and implementing positive solutions that, in turn, would improve the performance and retention of staff.

Human resource development is not only critical with respect to the technical capacity to create, distribute, and use information but also in terms of the more practical capacity to leverage information for socio-economic development. Experience from much of the developed world, in dealing with similar problems, well demonstrates the importance of these. Human capital is a major cornerstone for the progress of any country and becomes even more crucial in meeting its healthcare imperatives. ICT offers the promise of new opportunities in helping to improve the delivery of healthcare, while addressing the new demands on the skills of health professionals.

Benefits of incorporating ICT in healthcare:

Improving the quality of overall care:

Patients will receive better medical care if they and their healthcare providers have access to complete and accurate electronic health records that aggregate information across time and organisations. Such records could improve diagnoses, prevent errors, and save precious response times

Greater engagement of patients:

The participation of patients in their own healthcare could substantially improve their care and the costs involved, especially in the management and treatment of chronic conditions like obesity and diabetes

Clinical studies of medical interventions:

Sound medicine, as is well-known, needs to be based on empirical evidence of how well particular interventions work for patients. While some questions can only be answered through clinical trials, a tremendous amount could be learned through the ability to integrate the combined experience of millions of patients. Aggregated, de-identified information could enable a wide range of studies on issues such as the efficacy of prevention strategies, the frequency of particular complications in particular environments, and the response of individuals to specific drugs as a function of genotype. Access to electronic personal health information and interfaces that make it easy for public and private clinical organisations to share health information with each other and with patients could enable healthcare providers and patients to collaborate in informed decision-making

Improved population-based knowledge:

Aggregated health information can provide invaluable tools for identifying and tracking

medical events such as epidemics and adverse events related to treatment

Development of new tools for medicine:

In most industries (such as retail consumer goods, shipping, and financial services), the availability of electronic information has led to an outpouring of creative tools that have improved quality and enabled new kinds of services. Healthcare could benefit greatly from such tools. Examples include home-based monitoring devices that could directly transmit data to physicians, systems that could help increase patient compliance with drug regimens, and computerised decision support systems that are able to incorporate the most up-to-date clinical knowledge

Increased administrative efficiency:

In most industries, electronic information also has led to a decrease in administrative costs, as many processes become automated. In healthcare, administrative tasks (such as filling out forms and processing billing requests) represent a significant fraction of healthcare costs. Health IT could streamline these tasks and significantly decrease costs

Reduce personal visits to doctors:

As all of us know, visits to doctors often require taking time out from busy schedules, and for those living in remote areas, this could even mean forgoing an entire day's wage. ICT in healthcare can enable remote consultation, diagnosis and treatment through telemedicine

Enable greater public access to health information:

This will help people improve wellness, learn about illnesses, find and use appropriate health services effectively and become informed of the best options and treatment practices that can be made more easily accessible

Some examples:

SMS Technology for TB Treatment, South Africa

Cape Town, in South Africa, has one of the highest tuberculosis (TB) infection rates in the world. The drug treatment regime for TB is difficult, but must be strictly followed in order to effectively treat the bacterial infection. Evidence suggests that in most cases TB patients fail to take their medication because they simply forget. Over 50 percent of people in the Cape Peninsula have access to cell phones.

A health consultant in Cape Town, South Africa, Dr. David Green was well aware of the high rates of TB infection. So, in 2002 he convinced the City of Cape Town's health directory to run a pilot project testing the use of cell phone technology to remind patients to take their medicine at one of the city's clinics. At the clinic where the pilot study was conducted, 71 percent of TB patients had access to a cell phone. The pilot was very successful, resulting in only one treatment failure of the 138 patients involved.

The primary objective of the project was to alert TB patients to take their medication through the use of SMS, therefore increasing recovery rates of patients and lessening the financial and physical burden on the public healthcare system. According to this study, Dr. Green used low-cost and robust technology, such as an open source software operating system, web server, mail transport agent, applications, and a database to send personalised messages every half hour to TB patients, who had been included in a central database, to remind them to take their medication.

Voxiva, Peru

Voxiva, a social venture, has developed a technology platform called Alerta that is able to collect data from a large number of people in disparate locations

in real-time and has the communication and messaging capacity to effect change immediately.

Alerta uses the existing telecommunication infrastructure in place, thus avoiding the prohibitive costs of newer IT applications. Combining the internet and the telephone, Alerta extends software application benefits to those without internet access.

The application can be adopted by users with any communication device and at any level of technological capability, suitable for remote areas with limited infrastructure. Rural Peru was chosen for the Alerta pilot project as it was an ideal

While some questions can only be answered through clinical trials, a lot can be learned through a de-identified integration of the combined experience of millions of patients

environment for testing the data collection system in relatively isolated conditions. The country had also demonstrated a commitment to rural connectivity and had a strong public health orientation. Peru's current disease surveillance system, however, lacked an effective communication system between health workers in rural areas and decision-makers in Lima.

The Alerta pilot project was intended to improve communication and reporting of health care workers in areas lacking internet access, both quickly and with no investment in additional hardware.

The objectives of the pilot project were:

- ▣ To broaden the network of weekly-reporting; health posts to include those located in less accessible, rural areas where inefficiencies inhibit reporting
- ▣ To develop a feedback loop enabling the Ministry of Health to relay information to the

health posts

- ▣ To improve the quality of data collected in the database

- ▣ To decrease the time spent by medical staff in completing hand-written documentation

Voxiva developed a simplified reporting information transferral system and health information database and created a user-friendly audio interface that enabled Alerta users to submit health reports via telephone. The pilot system connected approximately 204,000 individuals in two areas of low population density, Chilca-Mala and Canete, and incorporated 76 health centres, health clinics, and district centres.

In a non-urgent context, Alerta can also facilitate the management of medical professionals

online pharmacies, to help people buy prescription and over-the-counter medicines legitimately.

Personal Digital Assistants (PDA), India

Personal Digital Assistants (PDA) have been used by auxiliary nurse midwives (ANMs) in India resulting in the reduction of paperwork and increased data accuracy. This has ensured the broader availability of data in electronic form. It is now possible, using PDAs, to transmit data through wireless communication networks, and enter it into a larger database using the Internet.

Mozambique Health Information Network (MHIN)

The Mozambique Health Information Network (MHIN) is a project that aims to strengthen the capacity of the Ministry of Health to collect, transmit and manage health data through the application of low-cost information and communication technologies. The MHIN project is jointly implemented by the Academy for Educational Development (AED) SATELLIFE Center for Health Information and Technology, MISAU, and the Mozambique Ministry of Science and Technology (MCT); through funds provided by the Canadian International Development Research Centre (IDRC) and the Canadian International Development Agency (CIDA). South African-based industry players – S-Curve Technologies cc and Thalamic Systems cc – provide technology support under not-for profit contractual arrangements. Launched in 2007, MHIN is currently operating in 68 health centres located in five districts of Mozambique.

ICT can facilitate the management of medical personnel in rural areas. It also helps them interact with each other via text and voicemail, enabling them to take timely decisions

in rural areas. Providers and users are able to interact asynchronously through forwarded voicemail to one or many users. Additionally, Alerta has the potential to play a key role in forming a baseline for disease behaviour in remote areas of Peru where no epidemiological data exists.

Buying medicines online, UK

Buying medicines over the internet has become increasingly common over the last few years. This may allow people to buy medicines conveniently, privately and at a competitive price. Some countries, including the UK, have a registration system for

The key objectives guiding the proposed systems design for MHIN were:

- ▣ To replace paper-based health data collection processes with computer-based systems to collect and share data

- ❑ To speed up the reporting of health data from rural and remote areas

- ❑ To improve the accuracy of reported public health data

- ❑ To improve clinical and public health information dissemination to rural health clinics

- ❑ To build technical capacity within the Ministry of Health to manage and expand MHIN and ensure system sustainability

To achieve the goal of improving the Ministry of Health's data collection, transmission and management, MHIN has deployed an innovative system for two-way data routing to update and synchronise data between health centres and a central database. A standard, off-the-shelf server is located at the ministry. Accessible via the internet, the MHIN server allows data downloads at national and district levels, as well as facilitating ministry's upload of data and information resources onto the server for dissemination to rural clinics. Each MHIN participant health worker uses a mobile device often referred to as PDA. Health workers input and save into PDA memory community health data such as polio and measles vaccination regimes, malaria treatment and birth registrations.

ICT and healthcare in India

The use of ICT in healthcare has seen varying success across states, due to different levels of engagement with the latest technologies.

For instance, in *Uttar Pradesh*, '*Aarogyam*' was launched as an end to end community-based digital health mapping project. Through this, citizens anywhere in India on any existing telecom network, can access information with respect to their health profile. It also provides a health database for a future healthcare strategy.

In *Tamil Nadu*, *Health Information Systems* was suc-

cessfully launched to strengthen information practices within primary healthcare with the larger aim to improve processes concerning healthcare delivery for the rural community. A significant percentage of the rural population is poor and resides in remote areas, hence directly depending on the effectiveness of primary healthcare for addressing the health problems of communities. The main objective was to devise and strengthen Health Information Systems and develop the capacity of the health staff to work on computers, with the ultimate aim that this would lead to better governance of the health sector and improved delivery of healthcare to the community.

GVK EMRI handles medical emergencies through the "1-O-8 Emergency service". This is a free service delivered through state-of-the-art emergency call response centers. It has ambulances across Andhra Pradesh, Gujarat, Uttarakhand, Goa, Tamil Nadu, Karnataka, Assam, Meghalaya, Madhya Pradesh, Himachal Pradesh and Chhattisgarh.

As per records, response times, and cases treated, healthcare services in the above-mentioned states have improved and reached the least accessible areas too due to the effective use of technology.

Critical questions and areas for intervention

Making healthcare facilities accessible to all and improving the quality of the facilities offered are basic rights that countries need to ensure. Despite this, people in rural or remote areas either do not have access to even basic healthcare facilities, or expensive treatment at private institutions places them out of their reach. *Can ICT help in making health-care facilities accessible to all? Can information and technology be used to improve health outcomes and transform service delivery channels?*

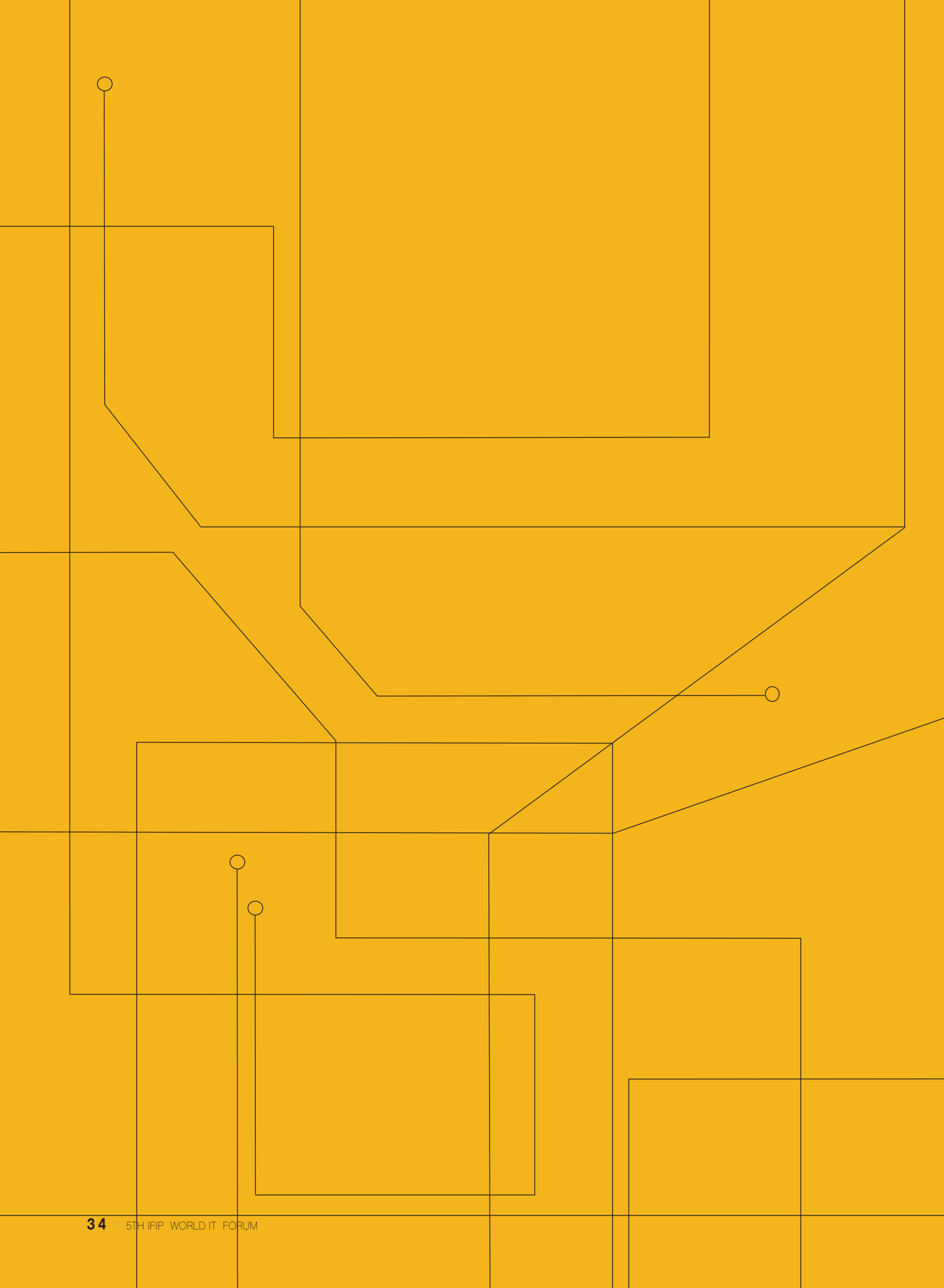
Healthcare, being more sensitive to trained

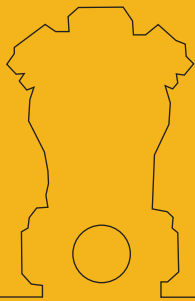
manpower than other services, and thus dependent on the availability and skill levels of those tasked with it, requires a highly trained and skilled workforce. Thus, human resource management in the health sector gains even greater importance. *Can ICT facilitate better human resource management in health?*

The increasing healthcare needs of an ageing population, expensive new healthcare technologies, new regional structures, a shift toward community-based care, the need for improved accountability, efficiency, equity, access, and quality, as well as the desire of people to be more directly involved in decisions about their health all represent significant challenges. Health information plays a key role in determining how these challenges are met. Advancements in technology and the increasing value of integrated health data, as well as the management of that data, are of vital importance. It is about improving the very nature of care itself through enhanced knowledge and understanding by means of supportive information systems, requiring a fundamental shift in which these systems of the future will be re-structured and managed. *How can ICT applications help in simplifying health information architecture management?*

The challenge of bridging infrastructure gaps (especially in developing countries) and capacity building, identifying the potential sources of money and resources, ethical issues such as confidentiality and privacy of patient data, reluctance of users to share the same, training health professionals who are ICT-illiterate, and the lack of trained medical staff are some of the issues which need to be tackled for the successful application of ICT in the healthcare sector. *How can some of these imperatives be institutionalised for ensuring more uniform progress across state and jurisdiction boundaries?*

These are some of the crucial questions the WITFOR Commission on Health seeks to address, in an area that requires focused attention from medical practitioners, the healthcare industry, academia and policymakers alike.





E-Governance

E-GOVERNANCE

The need for transparent and accountable governance in meeting the overall development goals of any country is widely accepted. The challenge before the governments of most of the emerging economies is to look at ways to improve governance. Citizens today benchmark government services against global best practices, as well as service delivery by the private sector. They are demanding better services in healthcare, education, banking and telecommunications, while demanding greater access to data and information.

In this context, ICT can be a significant enabler. It improves transparency, quality, as well as access to – and delivery of – government services. But the use of ICT in governance poses several challenges. On the one hand, there is the need to build capacity and leverage the latest technologies; while on the other there is an equally great need to understand how the use of these technolo-

gies can drive the larger political agenda of inclusive growth and accord greater power to the people. According to UNESCO, “Governance refers to the exercise of political, economic and administrative authority in the management of a country’s affairs, including citizens’ articulation of their interests and exercise of their legal rights and obligations. E-Governance may be understood as the performance

of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public, and other agencies, and for performing government administration activities.”

Electronic (e) services help the government get closer to the citizens by creating awareness about their rights and the availability of public services, thereby encouraging greater participation. Moreover, they increase transparency, reduce corruption and encourage balanced regional development in the country. One of the real challenges faced by most of the emerging economies is reaching citizens in remote corners of the State to provide them with information and access to various government services. In turn, this often makes it difficult for citizens to leverage the full potential of State initiatives.

Also, given the scale and complexity of the task, there is a need to fill in crucial gaps in peer-to-peer learning and capacity building amongst policy makers, government officials and the vendor community, as well as those in other public services. There are a number of issues that must be addressed, at various stages of inception and implementation, before results can become visible. Some of these – in no particular order – are resistance to technology; problems of adaptation and standardisation of systems across departments, streamlining of internal processes, management of e-Waste and, most importantly, e-Security.

Core principles of e-governance

According to the World Bank, “E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better deliv-

ery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.”

Clarity of Purpose

There needs to be a clear understanding and appreciation of the purpose and objectives to be achieved through e-Governance. Often projects appear to be based on what technology can achieve rather than what the citizens need. A corollary of this would be to agree on a precise definition of the parameters against which any future evaluation needs to be done. E-Governance should not be taken up merely to demonstrate the capability of an existing technology, but the technology needs to be adopted to solve an existing problem. Citizen-centricity should be at the heart of all e-Governance initiatives.

Environment Building

There is a need to change the mind-set of all the stakeholders involved, i.e. politicians, government officials, industry and civil society at large. This requires a strong will to change among various stakeholders in the overall governance edifice. As the task involves redesigning of governmental processes at various levels, implementing e-governance requires strong political support at all levels. On the other hand, government personnel need to be incentivised to change old habits and acquire new skills, even as public awareness is created.

E-Governance as an integral part of administrative reform

E-Governance cannot be separate from the act of governing as a whole. Further, it cannot be treated as a mere adjunct of governance. It has to be an inte-

gral part of the governance structure and processes. Thus, as we move towards greater integration of ICT in our lives, every government organisation or entity, every programme or policy and every law or regulation would have to inter-weave the principles of e-governance as part of long-term strategy rather than introduce technology-enabled governance as an afterthought.

This is also because the range of technological tools provided by ICT will always remain, at best, an enabler. A simultaneous move toward re-constituting or modifying existing structures and processes through the greater use of technology is the key. This is where e-governance needs to be made an integral part of organisational or administrative reform.

E-preparedness and a step-wise approach

There needs to be a step-wise approach to e-governance so that outcomes are maximised and citizens can reap early benefits from a move to the electronic delivery of services. As e-governance is expected to touch all aspects of governance – economic, social and administrative – a step-by-step prioritisation of activities assumes great significance. E-preparedness and a step-wise approach would require starting small and consequently building up on successes. Most technologies pre-suppose a set of rational behaviours on the part of, especially, new users. This element needs to be emphasised during the initial stages and reiterated during the capacity building stage, as well as over the entire life cycle of a particular project.

Monitoring and Evaluation

Close monitoring of ICT-enabled projects is necessary from the pilot phase itself. This helps in early detection of problems and hence facilitates prompt corrective action. However, apart from periodic monitoring of e-governance initiatives in the post-

implementation stage, there is also a need to evaluate the impact of such initiatives through independent agencies, against parameters that would determine whether the objectives have been achieved or not.

Developing secure and disaster-recovery systems

Given the sensitivity and scale of data involved where the State is concerned, the technological architecture on which all data storage and applications rest needs to be made not only secure, but also fitted with built-in disaster recovery mechanisms. Such mechanisms need to be incorporated from the outset, to develop these systems in a perpetual 'safe mode', easily retrievable in times of crisis. Further, depositories and 'mirrors' need to be created, with sound disaster recovery modules infused with adequate security features to prevent loss of data and a potentially debilitating collapse of the system.

Sustainability

In the end, e-governance initiatives need to be sustainable. Once it has been established that any particular initiative is a more efficient way of providing services or information to the people or conducting government business, it should not be allowed to relapse on grounds of expediency. Reforms are always harder to implement and sustain, but once they take root, the results far outstrip the teething troubles of initiating them.

Sustainability could be addressed in many ways – some initiatives may require designing in a way that they are financially sustainable. Others may be driven by administrative objectives or the sheer simplicity of use. Saving time and money may be the driving force in case of some projects.

All these factors, on their own and in conjunction with each other, can help justify the scalability and replication of a particular initiative.

Development of Local Language Interfaces

E-Governance initiatives need to provide citizen interfaces in the respective local language. Thus, displays and keys should ideally be based on localised interfaces, especially in a multi-lingual and diverse country like India. Multi-media instructions should be commonly used to make the interface accessible to rural users, where low literacy rates can pose significant obstacles.

E-Governance – a continuing process

E-Governance represents a paradigm shift in the field of governance reforms. Initiating and sustaining it needs to be a continuing process, one which requires multi-faceted adjustments. To use an oft-repeated refrain, e-Governance is a journey and not a destination.

Broadly, some of the benefits are:

According to the 11th Report of the Administrative Reforms Commission (ARC) – a committee appointed by the Government of India for giving recommendations to review the public administration system of India – in the end, e-Governance is about reform in governance, facilitated by the creative use of Information and Communications Technology. It is expected that this would lead to:

- Better access to information and quality services for citizens: ICT would make available timely and reliable information on various aspects of governance. The ultimate objective of e-Governance is to reach out to citizens by adopting a life-cycle approach i.e. providing public services to citizens that are required right from birth to death
- Simplicity, efficiency and accountability in the government: Application of ICT to governance, combined with detailed business process reengineering would lead to simplification of complicated processes, weeding out of redundant pro-

cedures, simplification in structures and changes in statutes and regulations. The end result would be simplification of the functioning of government, enhanced decision-making abilities and increased efficiency across government – all contributing to a more accountable, efficient and transparent government machinery. This, in turn, is likely to result in enhanced productivity in all sectors

- Expanded reach of governance: Rapid growth of communications technology and its adoption in governance would help in bringing government machinery to the doorsteps of the citizens. Expansion of telephone network, rapid strides in mobile telephony, spread of internet and strengthening of other communications infrastructure would facilitate the delivery of a large number of services provided by the government. This enhancement of the reach of government – both spatial and demographic – would also enable better participation of citizens in the process of governance

- E-commerce for direct linkages between local producers, traders, retailers and suppliers

- E- Authentication: This can help reduce identity theft and enable individuals to use online applications more securely, across a variety of verticals, such as healthcare and banking. Individuals can use an e-ID to authenticate online services, securely communicate online, purchase goods and services, and create legally-binding electronic signatures, such as signing a contract

- Just like businesses, the State can use identity management functions to better interact with citizens on the Internet, such as to authenticate users on online applications or – quite simply – verify their ages for eligibility of services. Governments can also use e-IDs to streamline public services, allow individuals to sign and submit forms online, and offer other innovative services

- While ICT leads to transformation in work processes, it also lowers transaction costs by

enabling transparency and accountability, both for the government and private vendors

- ▣ **Reduced Corruption:** It also helps to reduce the discretionary powers of government officials and reduces manipulative capacity and misuse of resources, thus enhancing the trust of people in government processes. It also enhances monitoring and control in the overall procurement process

Some examples:

India's National e Governance Plan (NeGP)

India's National e- Governance Plan (NeGP) of 2006 has paved the way for a systematic, wide-scale implementation of e-Governance across the country. It focuses on the creation of the fundamental infrastructure required for e-Governance. It takes a holistic view of various e-Governance initiatives being undertaken across the country and integrates them into a collective vision of making "all Government services accessible to the common man in his locality, through common service delivery outlets and ensuring efficiency, transparency & reliability of such services at affordable costs to realise the basic needs of the common man".

This has, in turn, been facilitated by the rapid evolution of India's IT industry. E-Governance can help curtail government expenditure through reduced paper work and increased efficiency of government employees. Additionally, through the roll-out of some services such as the e-filing of income tax, the government can increase its revenue collections.

Still, considering the larger perspective, and given that thousands of departments all over the country continue delivering public services manually in a largely inefficient manner, e-Governance in India is still at a nascent stage. But there is an increasing recognition of the fact that the implementation of e-Governance strategies in a time bound and

efficacious manner is essential to public interest.

The NeGP has developed 27 Mission Mode Projects (MMPs) at the central, state and local government level to transform high-priority citizen services from the currently prevalent system of manual delivery to e-delivery. These include projects in the areas of Income Tax, Customs and Excise and Passports at the central level and Land Records, Agriculture and e-Districts at the state level - to name a few. There are also a number of integrated MMPs such as e-Procurement and Service Delivery Gateways, which require coordinated implementation across multiple departments.

Bhoomi - Karnataka, India

Bhoomi (meaning land) is the project of on-line delivery and management of land records in Karnataka. It provides transparency in land records management with better citizen services and takes discretion away from civil servants at operating levels. The Revenue Department in Karnataka, with the technical assistance from National Informatics Centre (NIC), Bangalore, has built and operationalised the Bhoomi system throughout the state. Bhoomi has computerised 20 million records of land ownership of 6.7 million farmers in the state.

It has reduced the discretion of public officials by introducing provisions for recording a mutation request online. Farmers can now access the database and are empowered to follow up. In the Bhoomi project, a printed copy of the Record of Rights, Tenancy and Crops (RTC) can be obtained online by providing the name of the owner or plot number at computerised land record kiosks in 203 *taluka* (division) offices, for as low a fee as INR 10 (about 20 cents). A second computer screen faces the clients to enable them to see the transaction being performed. A farmer can check the status of a mutation application on Touch Screen Kiosks. If the

revenue inspector does not complete the mutation within 45 days, farmers can approach a senior official with their grievance.

Mutation requests are handled strictly on a first-come-first-served basis eliminating preferential treatment and discretionary powers of the civil servants. Operators of the computerised system are made accountable for their decisions and actions by using a bio-login system that authenticates every Login through a thumbprint. A log is maintained of all transactions in a session.

The new system has brought about a sea change in the way land records are maintained and administered in the state. The system has not only simplified the process of record keeping but has also provided many collateral benefits, while proving to be financially self-sustainable. It has become a trendsetter for e-Governance projects in the state as well as in other parts of the country.

In the next phase of Bhoomi, the 'Land Records on Web' is to be established wherein, all the *taluka* databases are uploaded to a web-enabled central database to enable private agencies to set up village – level kiosks for downloading land record documents for issuing to farmers, in a mutually-beneficial Private Public Partnership (PPP) model. Some of the direct benefits of Bhoomi for the farmers are: the reduction in processing time for mutation; online tracking of the mutation status; easy access to farm credit; and ease in case of legal matters.

For administrators, in turn, it provides: ease of maintenance and updation of land records documents; quick and easy access to the same, especially for analysis purposes; and greater ease of monitoring government land.

E-Procurement – Andhra Pradesh, India

Prior to the introduction of an e-Procurement system in the state of Andhra Pradesh in India, procurement in government departments was done through

a manual tendering process. The process consisted of a long chain of internal authorisations and scrutiny, which necessitated several visits by the suppliers to government departments. The manual tender system suffered from various deficiencies, including discrimination, cartel formation, delays, lack of transparency etc.

The Government of Andhra Pradesh introduced the e-Procurement project in 2003 with the following objectives:

- To reduce the time and cost of doing business for both vendors and government;
- To realise better value for money spent through increased competition and the prevention of cartel formation;
- To standardise procurement processes across government departments/agencies;
- To increase buying power through demand aggregation;
- To provide a single-stop shop for all procurements; and
- To allow equal opportunity to all vendors.

In order to achieve these objectives, the entire e-Procurement process was designed to avoid a human interface i.e., supplier and buyer interaction during the pre-bidding and post-bidding stages. The system now ensures total anonymity of the participating suppliers, even to the buyers, until the bids are opened on the platform. The e-Procurement application provides automatic bid evaluation based on the evaluation parameters given to the system. These improved processes have eliminated subjectivity in receipt and evaluation of bids and reduced corruption to a significant extent.

Further, to bring transparency in e-Procurement, tender documents containing all details are hosted on the website. The documents can be

downloaded by the interested suppliers free of cost, from the day of publication of a tender. At any time in the procurement cycle, any person associated with the transaction can check and know the status of the transaction. This saves time and effort involved in finding out the status of a purchase order, besides enabling better planning of inventory.

At the outset, an effort was made to standardise the procurement processes and forms followed by various departments especially for public works tenders. Today, all the 'Promoting e-Governance' – departments are following a common tendering process and forms for works tenders. These processes have been re-engineered to further improve the efficiency and curtail subjectivity in tender evaluation by the department users. They have helped usher in greater transparency, reduced costs (including those for advertising), besides making a visible social impact, as citizens are assured that government procurement is conducted in a transparent manner, saving taxpayers' money, in turn.

Belgium- e ID

Belgium has worked diligently to provide an e-IDs to its population of over 10 million. Conceived in 2001, e-ID cards were officially launched in 2004; as of 2009, 90 percent of Belgian citizens had one. With over nine million e-IDs in circulation, the Belgian personal identity card (BelPIC) is the largest national e-ID system in Europe. The card is compulsory for citizens from the age of 12.

Since 2004, early adopters of the Belgium electronic ID card could use the card to authenticate e-government applications, using a digital certificate stored on the card. Today citizens can use the card for a variety of applications, such as digitally signing their electronic tax filings. The Belgian government now offers over 600 services online for its citizens, including applications such as "Police on the Web" that allows citizens to interact with local police to re-

port stolen items or even graffiti. The e-ID can also be used to purchase tickets, as for sporting events—cardholders who do so then use their ID card as their ticket to enter the stadium.

UID- India: The Aadhaar Project

The Unique Identification Authority of India (UIDAI) has been created with the mandate of providing a Unique Identity (Aadhaar) to all residents of India. The UIDAI proposes to provide online authentication using demographic and biometric data. The UID Number, which uniquely identifies a resident, will give individuals the means to clearly establish their identity to public and private agencies across the country.

The purpose of authentication is to enable Aadhaar-holders to prove identity and for service providers to confirm the resident's identity claim in order to supply services and give access to benefits. Such authentication shall make life simpler to the resident as it is meant to be a convenient system to prove one's identity without having to provide identity proof documents whenever a resident seeks a service.

The m-Pesa

The m-Pesa model is a mobile-based money transfer service launched in Africa in a partnership between Vodafone and Safaricom. In this model, customers can use a wallet on their mobile phone to make payments, transfer money and redeem cash. The servicing of these customers is through the network of airtime resellers.

The m-Pesa model offers several features such as:

- Withdraw and deposit cash
- Utility bill payment
- Money transfer

The m-Pesa model is quite popular in many coun-

tries of Africa, such as Kenya, Tanzania, and South Africa.

e- Mamta, Gujarat, India

Recognising that the reduction of Infant Mortality Rate (IMR) and Maternal Mortality Ratio (MMR) are important public health challenges for India, the Health and Family Welfare Department of the Government of Gujarat, introduced a Mother & Child-name based tracking Information management system called “E-Mamta” in collaboration with the National Informatics Centre (NIC), Gujarat. The system was conceptualised and developed by Gujarat for the first time and the Government of India has adopted the system for replication in all the other states of India.

The system covers the entire population of Gujarat with special emphasis on rural, urban slum and slum-like populations. Health details of about 85 lakh families in the entire state, comprising about 43 million individuals, and covering more than 80 percent of the population have been entered in the software’s database and system-generated unique Health IDs have been provided to all.

The system aims at registering individual pregnant mothers, individual children in the age group 0-6 and adolescents, along with their full details to ensure complete service delivery of Ante Natal Care (ANC), Child birth, Post Natal Care (PNC), immunisation, nutrition and adolescent services – and to track the ones that have been left out. It also provides a management tool to the service providers at the grass roots to determine the potential recipients of the services along with their details, through comprehensive work plans. Finally, the services are aggregated to generate reliable and valid reports.

Key Features

- A management tool to provide comprehensive MCH services to the target population and ensuring

complete & timely service delivery via the unique feature of name-based tracking

- Complete family health database of the entire population in the back end

- Territorial Mapping of data up to the village and Anganwadi (courtyard shelter) level to facilitate, search and segregate relevant data for the user

- Complete life cycle approach: Data of an individual is recorded from birth to death

- Incorporation of work plans for grass-roots-level functionaries for clear understanding of targeted beneficiaries

- Resolution of migration/ transfer issues in service delivery through provision of Unique IDs to individuals

- No duplication of registration of mothers, as the individual is the unit. All pregnancies of a single mother are recorded together

- SMS alerts to beneficiaries and service providers for services that are falling due

- Integration with the HMIS and automatic generation of various reports & registers through aggregation

- Search on several parameters like name, village name, ration card number, mobile number, health ID, family ID UID, etc.

- Unique ID (Aadhaar) compatible

- Records, e-details of various incentives paid to all cadres of health workers individual records for the benefits of social sector schemes

- Database of all service providers and communication platform

- Dashboard to give a brief overview of data entry, deliveries, immunisation services, maternal and infant deaths.

- Notice board for communication

- Citizen-centric features like immunisation records, child growth charts etc

- Works on the Gujarat State-Wide Area

Network (GSWAN) as well as on any regular internet connection

Critical questions and areas for intervention

The government of a country is usually the largest procurer of goods and services. E-Procurement is a collaborative procurement of goods, works and services using electronic methods at every stage for bringing in efficiency & transparency. The goal & objective of e-Procurement is to enhance the quality of public procurement through the implementation of comprehensive, end-to-end IT solutions.

The idea is to automate and re-route the entire public procurement activity being undertaken by the governments in a phased manner, to an online, web-based, real-time environment. Taking the example of the e-procurement model adopted by emerging economies like India, *can technological interventions address broader governance issues?*

Electronic authentication provides a level of assurance as to whether a user or consumer of services is who they claim to be, in a digital environment wrought with issues of privacy and security. Thus, electronic authentication plays a key role in the establishment of trust relationships for electronic commerce, electronic government and many other social interactions. It is also an essential component of any strategy to protect information systems and networks, financial data, personal information and other assets from unauthorised access or identity theft. Electronic authentication is therefore essential for establishing accountability online. *How to handle challenges and issues in E-Authentication, especially as large private-data sets are created and hosted online?*

Lack of IT Skills among employees, lack of resources available with governments, political resistance, change management, broader resistance to change are some challenges that need to be addressed, when looking at issues of building capac-

ity. *What are some of the challenges that exist in scaling up and institutionalising the use of ICT with special attention to project management, administrative reform and cyber-security?*

Technology is the key for financial inclusion because it is one of the ways in which costs of transactions can be significantly reduced. In a vast country like India, an overwhelming majority remains unbanked or 'under-banked'. But not all technologies are feasible if the goal is financial inclusion – given issues of affordability, accessibility, security and privacy. Wireless technologies, especially mobile phones, are fast-emerging as one of the most potential and well-suited channels for financial inclusion. Use of the mobile phone is also conducive to situations where a majority of the population is illiterate or semi-literate. *What hope do mobile technologies provide for ushering in greater financial inclusion?*

These are some of the key questions the E-Governance Commission of WITFOR seeks to address, while looking at the broader challenges of governance in an increasingly inter-connected world, where fast-moving technology provides both opportunities and pitfalls in equal measure.

