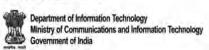# The 5th
World IT Forum
IFIP WITFOR 2012

Proceedings
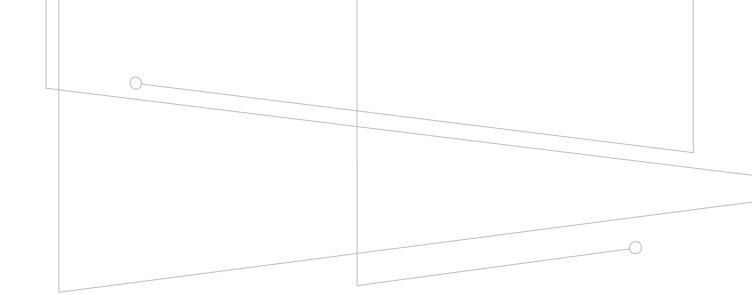
The Fifth
World IT Forum
IFIP WITFOR 2012

PROCEEDINGS

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Foreword

PROF. CHRISANTHI AVGEROU

PROFESSOR, LONDON
SCHOOL OF ECONOMICS, AND
CO-CHAIR, INTERNATIONAL
PROGRAMME COMMITTEE,
WITFOR 2012

"What appear to be obvious consequences of technology do not materialise without management and policy efforts for socio-economic change."

WITFOR is remarkable among a plethora of international conferences on IT and development because it brings together policymakers, NGOs, and a broad range of technology and development professionals to share aspirations and draw lessons from diverse experiences of making IT work for development. WITFOR 2012 in India has been particularly conducive to such exchange of ideas and debate. The host country offers experiences from an unprecedented era in the history of IT, for development: a world class IT industry, a government capable of and willing to invest in ICT infrastructure across the country, an administration that is keen to take up IT innovation, and an active civil society engaging with the controversies of development and democracy. Moreover, across developing countries, the continuing diffusion of the internet, the incredibly fast take up of mobiles, and increasing numbers of people exploiting them both for entrepreneurial ventures and political activism have formed a new backdrop for development policy action.

And policy action is certainly needed. It would be a mistake to extrapolate socio-economic impact from technology affordances alone. Even what appear to be obvious consequences of technology do not materialise without management and policy efforts for socio-economic change. Productivity increases do not automatically result from the use of IT in business or administration and decentralization of administration and responsiveness to citizens do not just follow from implementing e-government. It would be foolish to expect that business activity that will benefit the poor and an empowered democratic polity will just result from Web 2.0 and mobile technology platforms. Most of the initiatives presented at WITFOR 2012 were indeed conceived and unfold within broader development policies such as for public sector reform, rural poverty alleviation and health care infrastructures. This is cause for optimism. I'm looking forward to the follow-up of these ICT-driven development initiatives in future WITFORs. END

Prof. Chrisanthi Avgerou

Executive Summary

MR. LALIT SAWHNEY
VICE PRESIDENT IFIP

"WITFOR focuses on the role of policy, implementation, innovation, and the interactions between governments and their citizens"

The IFIP World IT Forum (WITFOR) is a unique global conference that brings together a variety of stakeholders together to assess, share and discuss ways in which the use of information and communications technology is addressing issues of development. Organised by the International Federation of Information Processing (IFIP) – the umbrella body of all computer societies in the world – and held in developing countries every two years, WITFOR seeks to draw the attention of policymakers to the potential of technology for development, its use for delivering the goals of inclusive growth and progress, while helping to highlight the challenges this poses for governments around the world, especially in emerging economies.

WITFOR's 5th edition in India held special significance, as India has proven itself as a crucible of low-cost innovation and superior technological prowess, geared toward meeting a number of critical developmental challenges and growth imperatives. The decision to focus on four core sectors: e-governance, health, education and agriculture, was taken keeping in mind both the development challenges in these areas and the corresponding need and potential for innovation in the country.

The Indian government has institutionalised the use of ICT for meeting its development goals through programmes and policies like the National e-Governance Plan (NeGP), which was notified in 2006. This envisions the use of technology to improve the functioning of the government and for improving the delivery of public services, while trying to bridge the gap between citizens' expectations and the State's efforts to meet them.

The WITFOR conferences focus on the role of policy, implementation, innovation, and the interactions between governments and their citizens, as well as the value of sharing best practices. At the heart of the deliberations at WITFOR are also questions like the 'measurable' impact of technology – whether the use of ICT

does actually bring about effective development and whether these results can be measured. Also of interest is the issue of business outcomes that WITFOR focuses on, while drawing attention to resourcing models and public-private partnerships in the use of technology for development.

At WITFOR India, the focus was on the role that ICT is playing in delivering sustainable development in the areas of e-governance, education, health and agriculture. In e-governance, the Indian government is trying to bring public services closer home to the citizens, especially focusing on those who have hitherto been left out of the ambit of inclusion – be it financial or digital. At the same time it is trying to throw open vast amounts of information, for the use and consumption of the wider public. It is also trying to use social media platforms and public, digital networks to connect with citizens, leveraging the power of new electronic tools like never before.

In the field of agriculture the conference focused on evaluating the hunger for technology, and its potential to revolutionise farming as the Green Revolution had once done. The focus was on 'putting farmers first', with special attention on the benefits that can accrue to small farmers, as they have both the most to gain and lose from the use of technology in agriculture. The focus was also on examining the role of pilot projects and how these can be scaled up and replicated. The use of 'mobile' technologies found a prominent place in the agenda, equally, in terms of their use for service delivery, information gathering and dissemination in the fields of agriculture and healthcare, as also in meeting the government's goal of financial inclusion.

New educational tools for the differently abled, vocational training and skill upgradation, innovative and sustainable digitisation of content, open learning and distance education were at the centre of the discussions to aid the delivery of quality education to India's valuable demographic assets. Participants also discussed the role of ICT in delivering quality healthcare; expanding its reach and coverage; the institutionalisation of ICT for better human resource management; simplifying health information architecture management and transforming service delivery channels to improve health outcomes.

The conference also focused on overarching issues like those of identity management, authentication, the role of ICT in addressing governance issues, building internal capacities, administrative reforms and cyber security. Most importantly, it engendered a lively and open debate between various stakeholders, especially different government departments and the private sector, leading to a truly meaningful discussion.

With the next WITFOR to be held in 2013 in Paraguay, it is my sincere hope that this unique conference's India edition will prove to be an important milestone in the WITFOR journey. END

About WITFOR

GENESIS

The World IT Forum (WITFOR) – organised by the International Federation for Information Processing (IFIP) recognises the developmental opportunities offered by digital technologies and the need for both emerging economies and the developed countries to collaborate and harness the potential of such opportunities, Given WITFOR's focus on the tangible impact of technology on development, its activities are broadly guided by the World Summit on the Information Society's (WSIS) Plan of Action, in order to help achieve the UN Millennium Development Goals (MDGs). The application domains being addressed are Agriculture, Building Infrastructure, Economic Opportunities, Education, E-Government, Environment, Health and Social Ethical Legal aspects. The concept of the World IT Forum is to bring together politicians, policymakers, researchers and practitioners from developed, emerging and developing countries with the aim of discussing ICT policies and best practice projects from around the world.

GOALS/ OBJECTIVES

India hosted the 5th edition of the Forum, the goal of the global conference being to contribute to the development of sustainable strategies for the application of information and communication technologies (ICT) in developing and emerging economies, through information and idea exchange between various stakeholders. WITFOR is officially hosted by the government of the host country, which is usually the ministry that is responsible for ICT. The Department of Information Technology, Government of India was the nodal organisation for the 5th IFIP World IT Forum which was held in New Delhi from 16-18 April, 2012 at its premier conference centre – Vigyan Bhawan.

The overarching goal of WITFOR is to assist developing countries in formulating and implementing sustainable strategies for the application of ICT and to share experiences that can help bridge the digital divide and improve the overall quality of life.

WITFOR 2012 was aimed at domain experts in the fields of agriculture, e-governance, health and education. It brought together ICT practitioners and researchers who are working to devise technological solutions to address the above opportunities, along with policymakers and leaders in these respective developmental areas.

The goal was to identify opportunities for ICT in addressing problems in the context of these four specific themes, and to share and discuss experiences in:

- Drafting and implementing ICT policies;
- Initiating and implementing ICT projects; and
- To present and discuss research concerning the overall goal...

...with the ultimate aim of developing a viable agenda for policymakers and industry alike in these four domains and the technologists represented in IFIP.

PREVIOUS WITFORS

Prior to India, four previous World IT Forums had been held in Vietnam (2009), Ethiopia (2007), Botswana (2005) and Lithuania (2003), chaired by the respective Prime Ministers of the host nations. The participation in WITFOR had risen from 600 in 2003 to 1500 in 2009, bearing testimony to its robust content and the diversity of attendees. The Indian edition hosted over 1000 speakers delegates and more than 80 speakers. END

WITFOR 2012, India

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

ORGANISATION

The International Federation for Information Processing (IFIP) – supported by the Department of Information Technology (DIT), Government of India – organised the Fifth World IT Forum (WITFOR) in New Delhi on April 16-18, 2012. WITFOR 2012 was supported by the Indian Ministry of Communications and Information Technology, via its Department of IT. The WITFOR National Organising Committee was chaired by the Indian Union Minister for Communications and IT & Human Resource Development, Shri Kapil Sibal, as the General Conference Chair of WITFOR 2012.

The Chair of the International Programme Committee was Smt. Rita Teaotia, Additional Secretary, Department of IT. The International Programme Committee for WITFOR 2012 was co-chaired by Professor Chrisanthi Avgerou, Professor of Information Systems at the London School of Economics and Political Science, and Professor S.V. Raghavan, Scientific Secretary to the Principal Scientific Advisor, Government of India. Individual theme-based Committees were headed by senior government officials from related ministries and departments, as well as the respective WITFOR Commission Chairs, who are senior members of the academia from various parts of the world.

INDIA AND WITFOR

As a country with enormous ICT capabilities but also equally enormous socio-economic development challenges, India attracts significant international attention for its efforts to exploit the developmental potential of ICT. At the same time, Indian policymakers and practitioners can learn from the experiences of other countries. WITFOR 2012 provided a unique opportunity for sharing knowledge on mobilising ICT for development, among a diverse range of professionals engaging in this effort in many countries with a variety of development challenges. WITFOR 2012 also provided a valuable forum for understanding how the power of ICT can be harnessed for sustainable development. It focussed, in particular, on Agriculture, Education, Health

and E-Governance, within the overall theme of 'ICT for Sustainable Human Development'.

With over 85 speakers spread across 16 parallel sessions and four plenaries, the Forum brought together a vibrant mix of policymakers and political leaders, social entrepreneurs, academic researchers, practitioners and executives from the private sector, both from India and other countries. To that end, the programme included influential speakers outlining their vision, presentations showcasing the use of ICT for development, research analyses of challenges that need to be addressed, and panel discussions sharing experiences in socio-economic ICT projects from around the world.

SPEAKERS AT WITFOR 2012

Speakers at WITFOR 2012 included high-level representation from UNESCO, the World Bank and UNDP, senior Ministers and MPs from South Asia, Latin America and Africa, senior bureaucrats and technologists from South Korea, Canada, Nigeria, Estonia, Kenya, Bangladesh, Malaysia, Moldova and from all across India, including a number of Secretaries to the Government of India and Health, Education and IT Secretaries from across states. Recognised experts from academia from both within and outside India featured as prominent speakers, including from the UK, Botswana, Finland, Paraguay and Japan, IGNOU, AICTE and NIOS; as did senior representatives from industry and business chambers, development organisations and public-private partnerships.

The Speakers' Corner included researchers, grassroots organisations and representatives from state governments and the private sector sharing their unique experiences, and projects in the field of ICT for development, with a diverse and vibrant audience.

PARTICIPANTS / AUDIENCE PROFILE

With over 1200 participants, delegates were drawn from the public and private sectors across India, as well as from Africa, Europe, Asia and Australia, including participants from Greece, Poland, Finland, Croatia, Paraguay, South Korea, Zimbabwe, Liberia, Nigeria, Kenya, Ghana and South Africa. Indian delegates included senior government officials from various states, public enterprises, private sector and academia, from all across the country, as well as independent researchers, ICT enthusiasts, students, entrepreneurs and members of the academia and development practitioners. END

WITFOR 2013 will be held in Paraguay.

Welcome Address

MR J SATYANARAYANA
SECRETARY, DEPARTMENT OF ELECTRONICS AND INFORMATION TECHNOLOGY GOVERNMENT OF INDIA

"A platform such as WITFOR provides a critical space where ideas can be deliberated upon, not just by idea owners but by a diverse range of stakeholders."

Honourable Minister for Communications and IT, Shri Kapil Sibal ji, Honourable Minister of State for Communications and IT, Shri Sachin Pilot ji, Shri Janis Karklins – Assistant Director-General, UNESCO, Mr. Leon Strous – President IFIP, distinguished delegates, friends from the media, ladies and gentlemen. It gives me great pleasure to extend a very warm welcome to all the participants of the World IT Forum 2012 and I thank you all for coming here. It is our privilege to host this premier 'ICT for Development' forum in India for the first time. I want to thank the International Federation for Information Processing for providing this opportunity to us.

Friends, the World IT Forum initiated a historic worldwide consultation on global trends in information and communications technology in developing countries by initiating projects in the different areas of the ICT spectrum. It was first held in Lithuania in 2003. As you all know, the goal of the Forum is to contribute to the development of sustainable strategies for the applications of ICT in the developing and emerging economies through information and idea exchange between various stakeholders. I firmly believe that in keeping with the traditions of the intense and fruitful deliberations of the past WITFORs, this WITFOR 2012 too will provide a fertile ground for the sowing of innovative ideas and for sharing knowledge on mobilising ICT for development amongst a diverse range of professionals engaged in this effort all over the world.

WITFOR 2012 will focus, in particular, on agriculture, education, health and e-governance within the overall theme of 'ICT for Sustainable Human Development'. Each day there is ample demonstration of how we are using ICT tools to facilitate our daily needs, spread across the areas of education, health,

agriculture and governance. If technology was a necessity at a certain point of time, today it is a fundamental part of our life. In my opinion an event such as WITFOR 2012 is critical in several aspects. First and foremost, it is imperative to scout and recognise ICT innovations and practices having a sustainable social and economic impact on the lives of communities and citizens.

Secondly, by scaling up such practices it can strengthen the support and linkages of such practices. Its visible impact will enable the spread of such innovative practices, thus addressing vital needs and contributing to sustainable development. Finally, with rapidly evolving technologies, a platform such as WITFOR provides a critical space where ideas can be deliberated upon, not just by idea owners but by a diverse range of stakeholders, thereby enabling the incorporation of different perspectives and perhaps enhancing the feasibility and sustainability of these projects. India is renowned for its IT prowess and now it has also been harnessing its efforts towards inclusive development.

There are many flagship programmes of the Government of India, such as the National e-Governance Plan, the National Rural Health Mission, the Mahatma Gandhi National Rural Employment Guarantee Scheme, ICT at Schools Scheme etc., where ICT is being used very effectively to enhance transparency and to improve the effectiveness of service delivery. In the exhibition here many such projects and applications are being showcased. I would encourage all delegates to kindly visit the exhibition, which will be inaugurated by the Honourable Minister directly after this session. Once again, I welcome all the delegates to WITFOR 2012 and hope that the deliberations here would lead to path-breaking projects and applications in the near future. Thank you, all. END

Inaugural Address

MR KAPIL SIBAL
MINISTER OF
COMMUNICATIONS AND IT
AND HUMAN RESOURCE
DEVELOPMENT,
GOVERNMENT OF INDIA

"In order
to ensure
information
flows we must
make sure
we have the
necessary
infrastructure
in order for that
information
to flow easily
and without
disruption."

My colleague and the Minister of State for Communications and IT, Sachin Pilot; Secretary, Department of Electronics and IT Satyanarayana ji; Assistant Director General, UNESCO, Janis Karklins; President IFIP, Leon Strous; distinguished dignitaries gathered here from all over the world and, I believe, come from around 30 countries, distinguished delegates, ladies and gentlemen and my friends in the media. First of all, good morning to you and it's really a happy occasion that India is hosting the 5th WITFOR. I believe it all started way back in 2003 in Lithuania and thereafter it went to Botswana, Ethiopia, to Vietnam and here we are in Delhi celebrating the 5th WITFOR. I think this is a great event for all of us and I especially welcome the delegates that have come from abroad to participate and, in the process, I hope that we will be learning from each other and sharing our experiences to find solutions for tomorrow - not just for us, but for the rest of the world. When I think of ICT, my thoughts go back to the fact that everything in civilisation depends on information, which means that information is really at the heart of all development. But we are in an age of digital information.

The quality of information has changed over the years and when I think of the ICT revolution, there are three elements that come to mind. The first is that, in order to ensure information flows, we must make sure that we have the necessary infrastructure. In order for that information to flow easily and without disruption, we therefore need a very strong information structure for the telecom sector. After we have that structure we must also have content, which is the information and the nature of that content to ensure there is enough quality content for that information. When we have the content and we have the infrastructure, we must make sure we have the necessary devices for the consumer to access the information. Now if one of the three elements is missing – any one of the three – we will not be able to achieve our goals. So, as nations move forward, we must ensure that all three elements are in place. That is easier said than done because, if you look at the world

today, a large part of the world has consumers that do not have the capacity to pay for the infrastructure and do not have the capacity to pay for the content. Those are the people who need the information for empowering themselves. Unless we are able to provide all these three at accessible and affordable prices, we will not be able to meet the Millennium Development Goals. Now, how are we able to manage that?

This is the great experiment that is taking place in India. In fact, I would say that India is the hot bed of innovation. India is at the heart of the innovation revolution in the telecom sector that will ensure that all the three elements are affordable and accessible, so that the price barriers are broken and the ordinary consumer in India is able to access the quality information that is necessary for us to move forward.

Well, we have started that off by ensuring that today in India there are about 900 million mobile phones and there is space yet for many more because not everyone has a mobile phone. Maybe people have two or three phones so the numbers do not reflect the reality, but there are still 400-500 million people who do not have mobile phones, which is the entire population of Europe. So there is enormous capacity there. What we have been able to ensure is that the mobile phone costs a fraction of what it used to cost, so the ordinary person – who we call *aam aadmi* in Hindi – has access to that mobile phone. He or she is able to empower himself or herself by using that phone. We have, of course, through the mobile phone, a relatively large infrastructure in place, including wireless and broadband infrastructure.

We are in the process of actually connecting each Gram Panchayat (rural local bodies) in this country to the Fibre Optic Network. One of our public sector organisations, the BSNL, is already connected to every block, but we want to go beyond that block to the Gram Panchayat and in the next two-and-a-half years we are going to connect 2,50,000 Gram Panchayats to the fibre optic network of enormous capacity. The last-mile connectivity will be done through broadband. Now, once that happens, every household in India will be connected. Content will be developed to suit the need of the consumer based on varied results like, as my colleague said, in 22 languages.

It must be made sure that the content that is developed is actually accessed by the consumer in the language he is familiar with, which means that you need to develop technologies to ensure instant translation of content in the language that is accessed by the consumer. That itself requires great innovation because the nature of the required content is so variegated that to have instant translation of the content in

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the required language is no easy job. Then you need to develop quality content so that the consumer is empowered. That requires sensitivity and innovation on the part of those who develop the content because they need to know the needs of the consumer in order to develop that content. This means that an enormous amount of research must go into what kind of content should be developed in the future, in the fields of education, agriculture, health care and e-governance.

The point I am making is that there is an enormous opportunity in India because it is an emerging market with 1.2 billion people, so you can imagine not just the complexity but the enormous depths of the market to allow innovations. We will have a knowledge network that connects 604 universities, which is the total number of universities in India, and about 35000 colleges. This will be connected in the next 3 months. Many of them have already been connected. This is the largest national enterprise anywhere in the world. What we are going to do through this network is allow the content to flow seamlessly to every student, wherever he is located. If we are able to actually reform the administrative structures within the university system and allow the kind of mobility that a student needs through a semester system, and through credits, then we will ensure that every student has access to quality teaching, no matter where the teacher is based. This is the kind of development of content and infrastructure that we are talking about.

Many people will talk about the lack of teachers across the world and the lack of brick and mortar structures throughout the country, but the fact is that once the ICT infrastructure and content is in place we can get over the problem of the lack of teachers. India cannot wait for the next ten years to build schools, because children will be 10 years older by the time you build those schools. So we need to move on to make sure that kids today have access, and the only way to do that is through the IT revolution. We are actually, in the years to come, going to have an ICT mission for schools – a National Mission for Education through ICT (NMEICT) for schools in India – and we will be connecting every school in the country. Now we are developing a system of setting up data centres. We do not want every sector of the economy to have a separate data centre. We are going to set up data centres that can supply data to the rest of the country from one centre and we are building ten such centres in India so that the capacity of the data is enormous. Anybody, whether in the private or public sector, can connect themselves to the data centre, which, in turn, can supply the data needed by the consumer anywhere in the country. We are setting up ten such data

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centres. One such data centre was inaugurated by me just yesterday. So we are trying to build an ecosystem through which we develop content, infrastructure and the connectivity with that infrastructure, and that's the only way we can move forward.

We need to do two other things, not just for India but for the rest of the world. The first is – and this is something that my colleague Sachin Pilot mentioned – we are developing an identity number for each citizen and each resident of India, which is the project called Aadhaar. So each person will have an identity number. I will tell you what this means if a school child has an ID number we can actually find out when the child is moving from one class to another. We can find out all the information about him in terms of how he is doing in class, where he is going from school after class 12 to college, what are the subjects he has etc. So we can actually monitor and it is not something that will intrude upon his privacy, but we are going to monitor his performance so that when we feel the children are not doing so well we can actually reach out to them to make sure that they are empowered in the area they are weak in.

So that is one project that is going on, and this project is just not in terms of education, this is in terms of agriculture as well. For example, the public distribution system (PDS) supplies foodgrains to those who are exceptionally poor and live below the poverty line. Once you have the Aadhaar you can make sure that the foodgrains are supplied to the targeted population because the PDS has leakages and those who are recipients of these benefits are not getting them. So once we have the Aadhaar it is only the targeted population that will have access to the foodgrains that they need. The point that I am trying to make is that every human activity through ICT has the potential to empower the residents and citizens of India and that is exactly what we are going to do. For example, take the maternal mortality rate (MMR) or the infant mortality rate (IMR) or the child mortality rate (CMR). Through ICT we can get the data about these on board and once we have the data on board we can again target the population that does not have access.

So all this is happening and we are building enormous databases in the country because at the heart of everything is data. These are the kind of things we are doing in the agriculture and health sectors, so that we are able to build content and data centres, so that the government and all those that intervene – including NGOs – have access to quality data through which interventions can be made for the purpose of empowerment. Take, for example, an agriculturist who doesn't

" We are developing an identity number for each citizen and each resident of India, which is the project called Aadhaar. So each person will have a unique identity number."

have access to quality seeds, doesn't have access to the knowledge as to when the monsoon is going to come or to the growth potential of the crop he has sown. All these can be done with interlinking geospatial data with IT and through our satellite network we can actually monitor the growth of crops and inform the farmer what needs to be done in the interim to ensure that he has good crops so that he can sell in the market. All market information can also be supplied to him through the ICT infrastructure. So whether it is agriculture, health or education, enormous amounts of information can be accessed by the consumer as we move along.

All this is only possible if the third element is put in place – devices. Unless the devices through which he accesses that information are accessible and affordable, he will not be able to benefit from that information. Now the mobile revolution has allowed services to be relatively less expensive so that they are affordable to the *aam aadmi*. But when you go in for 3G and 4G, the devices are going to be more and more expensive. So this revolution of 3G and 4G is going to be limited to the elite, unless we are able to develop manufacturing capacities at home to ensure that the cost of devices goes down. Then we need to move from an IP4 regime to an IP6 regime because that is what India has to ultimately embrace to ensure the connectivity between devices.

In order to do that, we must establish manufacturing capacities in India, because those manufacturing capacities – and their economies of scale – will allow India to produce devices at a lower cost than anywhere else in the world. As I have said, the cost of a device manufactured in India will be accessible to the rest of the world as well. So any solution here will be beneficial not only to the 1.2 billion people in India but for the rest of the world. Therefore it is very significant that this conference is being held here in order to discuss the issues of this nature, because it is in the emerging economies where we have the potential to find the solution for sustainable development for the rest of the world. This is because the saturated markets of the Western world will only be able to produce all these solutions at a much higher cost, which will still not benefit two-thirds of the global population. So I think the world should start changing the mindset and realising that the potential solutions for tomorrow, for a sustainable planet, are going to actually emerge from countries like India and China. Unless that realisation takes place, and unless that mindset is changed, we are not going to be able to get the solution. The last element that we are going to discuss here is e-governance. Let me just mention a bit about that. Now you may

"We must establish manufacturing capacities in India, because their economies of scale will allow India to produce services at a lower cost than anywhere else in the world "

have all these things, but the potential of all these things is to free up information and when the information is freed up it impacts governance. The more information that is available with the citizen, the more open is the government. Therefore, in a sense, directly or indirectly, this will have a huge impact on an open and transparent government. Because when the consumer knows all the data and he has access to the data, he will make the government accountable. He will ensure and ask the kind of questions that the government will have to answer. But over and above all, the government itself, in India, is doing enormous things in the area through the use of ICT to make our government more open and accountable.

One of the things we are going to do – and this was also mentioned by Sachin – is that we are going to move forward through a Bill that has already been introduced in the Parliament – the Electronic Service Delivery Bill – which makes it incumbent on all states in India – in less than 5 years – to tell us and ensure the data of public services is available to the consumer at large, whether in the payment of electricity bills, water bills, your insurance claim, delivery of your passport and other public services. Once the public service delivery bill is in place then all this public services data will be available to all citizens of India. This, of course, will make everything much quicker. It will impact and reduce corruption in a big way because there will be no intermediaries in the process and all the information will be delivered and will be freely available to the consumer. This will make the PDS system far more accountable.

Of course there will be services that cannot be electronically delivered, but a system will have to be put in place there to ensure that mechanisms are introduced, which will make our public system far more accountable than it is today. So all these measures must move parallel to each other. We can't do one without the other, and you can't rely on one without relying on the other. It is this ecosystem that needs to be developed not just in India but the in the rest of the world as well and that's really the challenge – not just for UNESCO or any other organisation, but it is a challenge for the global economy.

People say that we live in a global village. The fact of the matter is that we are moving towards the global village. But India and the world and the citizens of the world, especially the less privileged, will only be empowered when the village becomes globalised. Let's dream for that and hope the village becomes globalised. Thank you. END

" Once the Electronic Service Delivery Bill is in place then all the public services data will be available to all citizens of India. This, of course, will make everything much quicker."

Special Address

SACHIN PILOT
MINISTER OF STATE FOR
COMMUNICATIONS AND
INFORMATION TECHNOLOGY,
GOVERNMENT OF INDIA

"The theme of
the Forum, 'ICT
for Sustainable
Human
Development',
could not be
more relevant.
ICT, if leveraged
effectively, will
transform the way
essential services
are delivered"

S hri Kapil Sibal, Honorable Minister of Communications and IT and HRD, Sri Satyanarayana, Secretary DIT, Mr. Karklins, Mr. Leon Strous, ladies and gentlemen, a very good morning and let me begin by extending a very warm welcome to all of you. I know some of you have travelled great distances to be here this morning. I wish you a good day of discussions and deliberations. I also wish to start by thanking the International Federation for Information Processing, the Department of Electronics and IT, Government of India, for organising the 5th IFIP World IT Forum.

The theme of the Forum, 'ICT for Sustainable Human Development', could not be more relevant. ICT, if leveraged effectively, will transform the way essential services are delivered. The World IT Forum is being organised in India for the first time and this is a matter of pride for all of us. India is a leading player in the IT industry, and our IT experts have been an important component of the country's economic success. However, now ICT is being leveraged by India to deliver equitable and inclusive services and governance, in ensuring inexpensive and easy access to essential services to a much larger portion of our population.

There are three components in this agenda. First, we are creating the necessary IT structure that will cater to India's needs in the future. Second, the government is working with the private sector to create an eco system that will enable our citizens to take advantage of the IT infrastructure that we create and, finally, these steps are being complemented by laws that will ensure delivery of basic services in livelihoods, health, education and finance. I will briefly touch upon the three areas. On the IT infrastructure front, we are in the process of developing a national optical fibre network for providing broadband connectivity to local governments. We are

also working with the state governments to set up state data centres, for states to consolidate services, applications and infrastructure, to provide effective electronic delivery of services – whether it is the government, government to citizens or government to business services.

India presents a unique challenge when it comes to delivery of essential services. The geographical, cultural and socio -economic differences across a large landscape means that many different models have to be adopted simultaneously. When it comes to using ICT to deliver health, education and financial services, the IT infrastructure has to be complimented by applications that accommodate these differences. We are working on these as we move along. All of India's 22 official languages have now been covered under the ICT literacy programme. Anybody can download the programme for free from the websites of the ministry and learn how to use computers in their own language. We are placing an equal emphasis on developing applications that are most relevant for us here in India. The farmers, students and young professionals are a group that forms a large chunk of Indian society.

To ensure equality of access to online services, nearly a hundred thousand common service centres have been set up. These centres will offer e-governance services and also voice and data content for services in rural areas. The Indian Parliament is also considering a Bill that will mandate the provisioning of all public services compulsorily through electronic means, to ensure transparency, efficiency in accessibility and reliability of such services. To ensure equality in the delivery of services, it is critical to empower our citizens. The government is working to constitutionally guarantee basic rights, like the Unique Identity project that people can use to identify themselves; an employment guarantee act that guarantees hundred days of wage-employed workers in rural households and a Right to Education that will make education free and compulsory for all children between the ages of 6-14.

The IT sector is going to play an indispensible role in ensuring that our inclusive growth and development agenda is successful. When IT intersects with laws that guarantee these basic rights, it creates a powerful ecosystem that enables us to reach out, improve accountability, transparency and decrease the

"When IT intersects with laws that guarantee these basic rights, it creates a powerful ecosystem that enables us to reach out, improve accountability, transparency and decrease the cost of service provision"

cost of service provision.

However, these outcomes are not guaranteed. We must, at all times, continue to work hard to innovate and improvise. The new IT-based architecture is going to benefit a large number of households. Small businesses can take advantage of IT to become more efficient and reach untouched markets. Cash could be transferred directly to beneficiaries under the various schemes. Farmers will be able to monitor crop prices; students in remote areas will be able to access advanced educational material online; India's next generation will know a different country.

Yet, one challenge we face in increasing IT and broadband penetration is that the costs of the delivery of such services have to be mitigated. Also, the cost of IT hardware and connectivity is a challenge. But India has been able to achieve telecom penetration by increasing competition in the sector and reducing costs. India has now one of the cheapest call rates in the world and inexpensive phones are easily available to buy. At last count we had more than 900 million mobile subscribers. We are trying to do the same in the IT sector by encouraging domestic IT manufacturing. India is in a position to be a leader, to show developing countries the path forward for inclusive growth and development and the use of IT to do the same.

As we inch closer to the 2015 deadline for the Millennium Development Goals. It can be an effective tool to close the gap in areas that perhaps less progress is being made in, and that is true not just for India but many developing countries around the world. I hope some of the partner countries will share their experiences at this Forum so that we can all learn from each other, and learn not just from the success but also from our failures in the past. This is an important platform where we can exchange ideas about issues that we must think about by leveraging IT, regulation, privacy, security of data at various levels of IT literacy, IT infrastructure for the future and digital inequality.

India – with a hundred million users – is the third-largest country in absolute terms of users after China and USA. A UN study has said that a ten percentage increase in the broadband penetration increases the country's GDP by 138 percent. We have a National Broadband Plan and we are working very hard to make sure that broadband access is made available not just to the large cities in India but to the hundreds and thousands of villages that

"India is in a position to be a leader, to show developing countries the path forward for inclusive growth and development and the use of IT to do the same"

most of our citizens reside in. Two-thirds of India is employed in agriculture, farming or agricultural services and they contribute 70 percent of our GDP.

The IT sector is contributing 7 percent of our GDP, so the growth potential, job creation and value addition lies in the area of ICT – not for the companies, big and small, to earn revenue dollars but to create for young people an opportunity to leverage and display their skills that are acquired while growing up. The 21st century challenges that India faces, I think, can be overcome by harnessing this latent potential of the talent pool that we have available, and for people who are using IT skills to make themselves more useful and contribute more meaningfully to the Indian economy.

Once again, I commend the visions of the Department of Electronics and IT and IFIP in organising this Forum. I hope the participants from India and all over the world who have joined us here at this Forum will find it useful and thank you very much to all of you for coming.. END

Special Address

MR. JANIS KARKLINS
ASSISTANT
DIRECTOR GENERAL,
COMMUNICATION AND
INFORMATION SECTOR,
UNESCO

"UNESCO believes that quality education, literacy and the innovative use of technologies are crucial for achieving international development goals."

Your Excellency Mr. Kapil Sibal, Minister of Communications and IT and Human Resource Development, Honourable State Minister for Communication and IT, distinguished Indian officials, Excellencies, distinguished guests, ladies and gentlemen, good morning. It is an honour for me to be with you today for the 5th IFIP World Information Technology Forum, which has been organised by the International Federation for International Processing, in partnership with the Department of Electronics and Information Technology of the Government of India.

I would like to underline that it is a particular pleasure to join you here today in New Delhi as it is for the first time that WITFOR has been organised in India, a country that has been recognised worldwide for the models of innovation in the use of modern technologies. The recognisation by the Government of India of the key role of ICT for supporting sustainable development is an important model of good practice. Ladies and gentlemen, this forum will provide an opportunity to hear the voices of pre-eminent experts, reviewing the most relevant digital innovation in the world today.

Fifty years ago, in 1962, the computer scientist named JCR Liklider formulated his concept of the 'inter galactic computer network'. In 1971 Ray Tomlinson sent his first email across the computer network using the 'at' sign to separate the names of the users and the users' machine. Exactly 20 years ago, in March 1992, writing an article for the Wilson Library Bulletin, Jean Armour Polly was the first to use the term 'surfing' the internet while describing his exceptional electronic journey into the realms of the internet. At that time there were 26 servers in the world. One month later, the first graphic internet browser was released. By 2002 there were 631 million internet users worldwide. Today one-third of the world's population is online and 45 percent of internet

users are below the age of 25.

There are now 1.2 billion active mobile broadband subscriptions in the world. This is 17 percent of the global population. The same number of people log into social networking sites; Facebook alone accounts for more than 800 million active users. The world has never been so connected .These technologies give us unprecedented opportunities for sharing information and knowledge. They represent a vital source of growth, power our economies and strengthen our societies to tackle the difficult challenges we face. We must live up to this potential. UNESCO believes that quality education, literacy and the innovative use of technologies are crucial for achieving international development goals.

Ladies and gentlemen, quality education is necessary and is an essential human right. It is also a marker for economic success. Education brings sustainability to development. Investing in education is the best way to invest out of a crisis .We are approaching 2015, the year of review of the MDG's 'Education for All' goals and other internationally-agreed development targets. We must answer tough questions. Are we reaching our objectives? How can we bridge the gaps that remain? There has been strong progress since 2000 and the number of out-of-school children worldwide has dropped by almost 37 million. The gender gap in formal education has been narrowed. There have been impressive improvements and involvement in primary education.

The above achievements show that the right investment policies and commitments can produce the private sector, such as the one established by UNESCO in 2004 to develop the ICT competency framework for teachers. UNESCO is designing such custom made solutions .We are working to ensure that the education for all has a meaningful impact on every society. The first match we can make is between capacity and need. In too many countries progress is blocked by political crisis and conflicts. It is exasperated by economic hardship and compounded by weak institutions. This vicious circle holds societies back.

This leads me to the second match that must be made in which UNESCO works to achieve a match between skills and the world of work. Education must prepare students for the needs of the 21st century. This places a premium on relevance. Students expect a quality education, an education that makes the most of the technologies available and an education in tune with time.

"Education brings sustainability to development. Investing in education is the best way to invest out of a crisis."

"Research shows that success in using information and communications technologies in education depends largely on the ability of teachers to integrate these technologies into the teaching process."

Technology can be a powerful educational multiplier but for this it must be integrated into learning and accompanied with new teaching styles. In many countries this calls for a profound shift towards a more interactive project-based learning, with more innovation and technology-based solutions.

Teachers are vital here, and UNESCO is working to improve the skills of teachers and to promote competency standards .We have been working with the private sector for a number of years on this. The information and communications technology competency framework for teachers is our flagship. It has set guidelines to help teachers develop skills to make the most of technology, for achieving results. I say this because I believe that today we stand at a crossroads. The world is not on track to meet development goals. There are still 67 million children not enrolled in primary school and a similar number of adolescents not enrolled in secondary schools. Almost 800 million adults remain illiterate, two-thirds of which are women. An additional 1.9 million teachers need to achieve the targets of primary education by 2015.

To reach education for all we must bridge several gaps. First, there is an equity gap. Deep inequalities of wealth, gender, language, location and disability continue to hold back progress in many countries. There is a quality gap too. Many learners have an education with skills that are not relevant to their personal fulfillment, including in the world of work. We also face a financing gap. According to the latest UNESCO figures, aid to education increased by one-fifth in 2008-2009 to reach $5.6 billion USD. This is positive but it falls far short of the real needs. Even if developing countries maximise their resources, an annual gap of $16 billion USD for low-income countries would remain to reach education for all.

These gaps take different shapes in different contexts, and bridging these gaps calls for targeted policies. There can be no one size that fits all. We need to fit to size. Progress is made, but the question of money is all about matching capacities with needs; and matching skills and knowledge to requirements of the market. This means making the most of innovations, notably in technology. It means building innovative partnerships with better learning. We presented the second version of the framework on October 30, 2011 during the UNESCO General Conference. This concept is the result of a collective enterprise that mobilised many

partners, including Cisco, Intel and Microsoft, the International Society for Technology and Education and experts from the Commonwealth of Learning.

This is an excellent example of how governmental organisations and private partners can cooperate to deliver concrete and useful results. But nothing can substitute a good teacher. Research shows that success in using information and communications technologies in education depends largely on the ability of teachers to integrate these technologies into the teaching process. Ladies and gentlemen, technology and skilled teachers are not enough to harness the full potential of ICT. Educational materials are another indispensible component of this equation.

The UNESCO programme of open education resources (OER) is a contribution toward that end. OER is defined as the learning materials that are in the public domain or are released with an open license that allows users to, freely and legally, copy, use, modify and re-share the information, or provide member states a strategic opportunity to improve the quality of information and education. This can lead to knowledge sharing, capacity building and help make substantive financial gains. The UNESCO OER programme is comprehensive, with strong partnerships and includes policy guidelines for decision makers, governments and educational institutions. The OER platform is an online platform that shares UNESCO's open education resources and is an online community for sharing experiences worldwide.

The upcoming 2012 Congress which will be held at UNESCO's headquarters in Paris from 20-22 June this year and is organised by the Commonwealth of Learning aims at showcasing the world of the practices and policies and encouraging more governments to use OER. We hope that the World Congress will adopt the Paris declaration, which will be guiding UNESCO's work with the OER for years to come. I would like to take this opportunity for highlighting the use of OER in India. Earlier this year, the Indira Gandhi National Open University agreed to adopt an institutional policy for its courses. As the world's largest university with more than 2.5 thousand courses, the possibility of these courses being made available online and to allow other institutions to legally and fully copy, use and modify and re-share them is a tremendous effort toward increasing access to knowledge. I trust the Government of India will be present at the higher level at the World Con-

> "While Information Technology is a vehicle, content is the real king. Our efforts should be to increase access to knowledge for sustainable development, creativity and innovation."

gress in June to properly showcase the Indian IGNOU policy and the many other shining examples of India's initiatives.

Ladies and gentlemen, I would like to showcase the other important areas in which UNESCO is working. While information technology is a vehicle, content is the real king. Our efforts should be to increase access to knowledge for sustainable development, creativity and innovation. UNESCO's open access programme strives to create an enabling environment in the member states for free access to pre-reviewed scholarly and researched information. It is available to open access research students around the world, to gain increased access to knowledge. Publications have greater visibility and readership and the potential impact on research is hidden. At its 35th session in 2009, the general conference of UNESCO requested the Director-General to develop a comprehensive strategy for the promotion of open access to scientific information and research. The comprehensive six-year UNESCO open access strategy was adopted by the General Conference in November 2011. Within the strategy, UNESCO focuses on the development of long-term solutions based on the inclusive approach of the framework on the follow up of the World Summit on Information Society and in line with the mandate of information for all programmes to contribute to the free exchange of ideas and knowledge, and to narrow the gap between the information rich and information poor. UNESCO activities in the framework of implementation of the strategy will focus on three core areas: provision for an upstream policy, advice and building partnerships, strengthening capacity to adopt open access and serving as a clearing house for information for the global access debate.

We have developed a set of policy guidelines for the implementation of open access to the member states. The policy guidelines developed to provide open access will be used as a major tool to provide the system of open access policy development in member states' research institutions. It is a reference document required by issues related to open access, and provides examples and templates for easy adoption of open access policy. UNESCO has also developed the global access portal which was launched on November 1, 2011, which provides knowledge and overview of the state of open access in member states. Currently it has information for some 148 countries and it is intended that the portal should be continuously updated to provide useful information

> "UNESCO hopes to focus on advice and building partnerships, strengthening capacity to adopt open access and serving as a clearing house for information for the global access debate."

about open access development, while linking it to major initiatives and portals around the world.

Ladies and gentlemen, let me conclude by outlining another important aspect of UNESCO's work, namely the preservation of documentary heritage includng digital heritage. In 2012 the Member of the World programme is celebrating its 20th anniversary. The programme's mission is to facilitate preservation, by the most appropriate technique, of the world's documentary heritage, to assist universal access to documentary heritage and to increase awareness worldwide on the existence and significance of the documentary heritage. The principal vehicle for such an earnest raising of awareness is the UNESCO Memory of the World Register, which now operates at the international, regional and national levels.

However, without diminishing the significance of the Register, it is essential to focus attention on other areas, especially digitisation and digital preservation where much remains to be done. Digital technology has become the primary means of knowledge creation and expression. All areas of life produce digital documents, which need to remain technologically stable and accessible in their authentic manifestation for current and future generations. Apart from digitally-created new documents, digital surrogates of traditional documents prepared to enable democratic access to hidden information and knowledge have also become an ever-growing part of the digital heritage. However the vulnerability of the documentary heritage in digital form is a major source of concern at UNESCO and UNESCO is striving to prevent the development of 'digital Alzheimer's'. The realisation of the growing importance and vulnerability of the world's digital documentary heritage led to the adoption of the UNESCO Charter on the Preservation of Digital Heritage in 2003. However, in 2009, a survey revealed that very few governments in either developed or developing countries had adopted or even articulated preservation and access strategy to their digital heritage. The survey also showed that hardly any country had undertaken steps to implement the provisions of the charter or were familiar with its recommendation. The safeguarding of digital documents requires specific measures that significantly differ from those needed for documents recorded on traditional support. Although digital documents are becoming the main source of knowledge their

"Most decision-makers are unaware of the risks of disappearance of the commonly-used means of transmitting and storing digital information such as e-mails, databases or websites."

permanence, authenticity, identity and integrity are currently and consistently at risk.

Few countries have yet adopted a national policy regarding digital information. Most decision-makers are unaware of the risks of disappearance of the commonly-used means of transmitting and storing digital information such as e-mails, databases or websites. They are often unaware of the implications of engaging in digitisation projects, building digital repositories and the scale of the resources required to preserve the authenticity of digital information and maintaining permanent access to it. This is why UNESCO is organising a multi-stakeholder conference on Memory of the World in the digital era, digitisation and presentation. The conference will take place from 26-28 September, 2012 in Vancouver, British Columbia in Canada, in cooperation with the University of British Columbia and other Canadian universities and in partnership with the International Federation of Labour Association, Google, Microsoft and others.

The expected outcome of the conference will include the policy guidelines on digitisation that will be recommended for adoption by the next UNESCO General Conference, and the update of the 2003 UNESCO Charter on Preservation of Digital Heritage. We will launch the emergency UNESCO digitisation programme that would allow immediate access to endangered documentary heritage and we will try to obtain commitment from the industry on the long-term accessibility to the information content in the existing format.

Ladies and gentlemen, in closing I would like to emphasise and reiterate the importance that UNESCO places on harnessing ICT for development. It is for this reason that the deliberations during the 5th session of WITFOR are very important for debate and progress in this area, worldwide. I thank you for your attention. END

Vote of Thanks

MR LEON STROUS
PRESIDENT IFIP

"I thank all the participants because ultimately it is the participants together with the speakers who make up the content, and make this a worthwhile event"
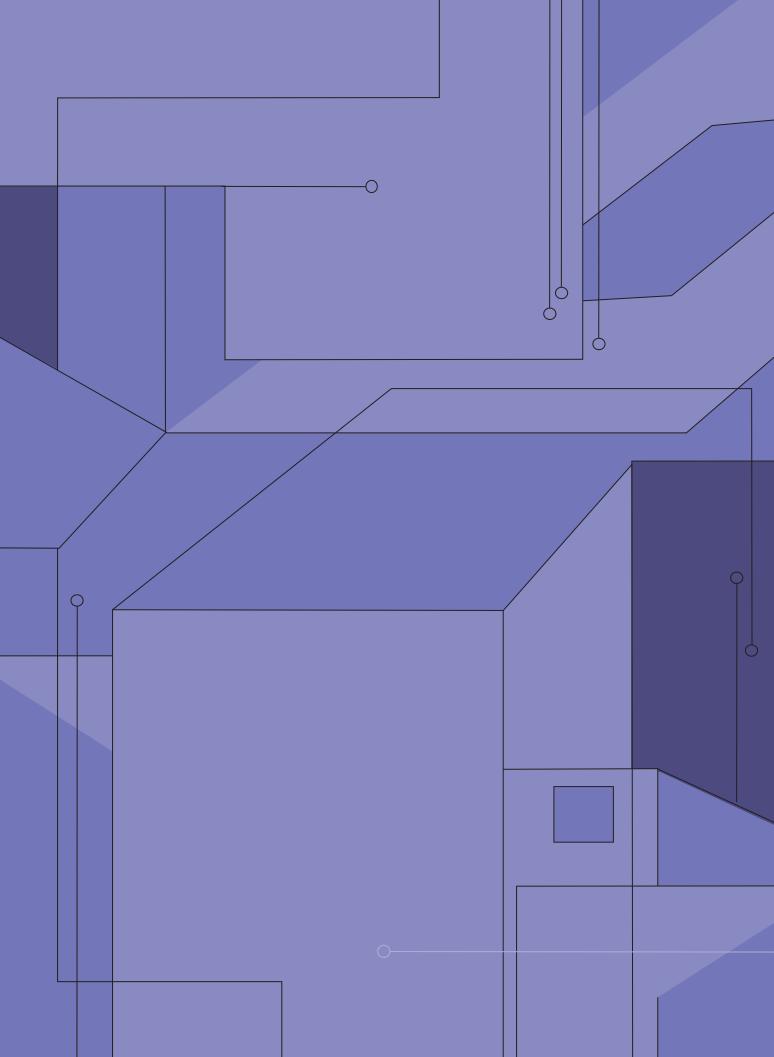
India offers us a unique opportunity to look at different challenges posed by the size of this country, by varied backgrounds, by a unique combination of, on the one hand, having a very advanced, top-of-the-bill ICT industry and, on the other, having a big need for ICT in other areas. Having visited India five or six times in the last two-and-a-half years made me realise what goes into preparing for this event. I have come to appreciate the dedication of many people involved to make this a success.

Starting to name people is too big a task, and I would run the risk of forgetting the names of people who have contributed significantly. I want to make an exception by thanking the Government of India and the Honourable Minister Mr. Sibal and Minister of State Mr. Pilot, because the key element of WITFOR is the dedication and true involvement of the Government, not only through the ministry of ICT but also the ministries of the application areas. So I will refrain from naming further names. Thank you, Honourable Minister, for the Government inputs and also for all the secretaries and all the people involved in different ministries.

In random order, we warmly thank all the speakers, all the people involved in the administrative and logistical arrangements, everyone in the Programme Committee, every one who has contributed in one way or the other. We thank the sponsors and, not in the last place of course, we thank the participants because ultimately it is the participants together with the speakers who make up the content, who make this a worthwhile event. Maybe I shouldn't call it an event. I would like to

see this as a meeting place to share experiences, as we have mentioned. Participants, contributors and organisers come from all different backgrounds – from the government, industry, the research environment, from UN bodies, from other organisations and NGOs, which gives us a unique blend to share all kinds of aspects.

I would like to finish with four 'encouragements'. I encourage all of you to be active in the sessions, don't just sit back and listen but actively participate, take part in the discussions, visit the exhibitions and the Speaker's Forum. Interact during the session breaks and, finally, make use of modern technology, pretend that you are twenty years or younger and use Twitter. Promote the event and use the hash tag 'WITFOR 2012'. Enjoy the event and I look forward to talking to as many of you as possible and, once again, I thank everyone who will and has made this a success. Thank you very much. END

Plenary

DR. B.K GAIROLA
DIRECTOR GENERAL,
NATIONAL INFORMATICS
CENTRE, INDIA

DR. HUN-YOUNG KWON
PROFESSOR, KWANG-WOON
UNIVERSITY, KOREA

MS. DOROTHY GORDON
DIRECTOR GENERAL,
ADVANCED INFORMATION
TECHNOLOGY INSTITUTE,
THE GHANA-INDIA KOFI
ANNAN CENTRE, GHANA
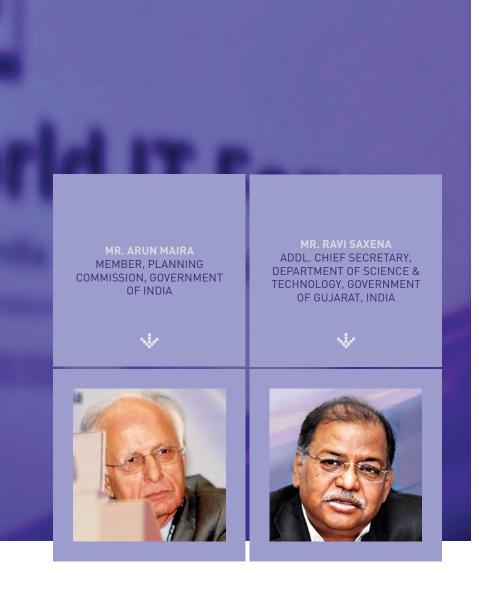
OPEN INNOVATION/ OPEN GOVERNMENT

SUMMARY OF THE DISCUSSION

The Chair, **Ms. Dorothy Gordon** introduced the session with the comment that 'open' and 'government' are words that don't usually go together, as governments are traditionally considered to be closed and conservative. But new technological developments, she said, are making it imperative that fundamental changes are taking place. This is significantly increasing the levels of complexity as governments go for more inclusive governance involving the co-creation and co-delivery of services with new roles for citizens, government officials and the private sector. She invited speakers to share ideas on how to build leadership competencies, ownership and promote attitudinal changes that go beyond physical infrastructure to actually create these new and complex systems that are going to guarantee national sovereignty and the security of national data, even as they open up to citizens and other stakeholders who can convert the idea of open government/ open innovation into reality.

Dr. B.K. Gairola began his presentation by saying that open government was not new to India and that the country had been contemplating the ini-

addressing the legacy challenges before government in each of these areas. The government, he said, is more than just an information system in technology terms, though technology does help in addressing the information asymmetry between the government and citizens. He called information the fourth pillar of democracy – provided it is accurate, reliable and unbiased. This is at the heart of the open data policy, he said.

The Indian government is seeking to build a National Information Infrastructure that can be seamlessly accessed across government and between the government and citi-

tiative for a few years now. He said that 'open government' meant the opening up of information and the provision of services, by using technology to overcome difficulties and deliver desired results. The National e Governance Plan (NeGP) had furthered this by aiding the delivery of services at the last mile, as it adjusts to the changed expectation of its citizens who want growth, inclusivity and greater participation. It is here that ICT serves as a delivery platform, ushering in transparency and accountability, which is important for the State.

Problems in doing this include corruption, ineffective delivery systems and services not being delivered to the last mile, as even the best technological tools cannot guarantee delivery of services. Some of the key components include transparency, innovation and re-engineering of systems and processes, across the three pillars of government: the executive, legislature and judiciary,

zens, the idea being how to make data accessible to all via an open data platform. Moving ahead to the cloud needs standardisation so that all components can be used as open source tools for the greater good, despite the reservations of some. The Right to Information has been good and its enactment has aided the move towards an open data policy. The fact is that the RTI is still based on a 'reactive process', whereas the new open policy aims to make the access to data 'proactive', leading to lesser RTI queries over time.

He also talked about the Open Government Platform (OGPL) project between India and the US that was launched a year and a half ago, allowing for the sharing of a variety of data sets, not just between the two countries but also by third party nations in the course of time – all of it built on open source software. He said that this carries huge potential for innovation by the private sector and NGOs as it is easy to use and highly configurable, lending itself to the

building of useful applications. He concluded by saying that, right from the inception stage, the idea is to ensure that it is in line with a vision of open government that is transparent and participative.

Mr. Arun Maira began by saying that leadership, ownership and attitude change are what is required to go beyond technology, and the Planning Commission of India's job is to think of the bigger picture and changes that are required at a broader level. Talking about the challenge that India's facing he exhorted the audience to think beyond technology and its use for improving ordinary lives. ICT and digital technologies have facilitated inter-connectedness like never before, aided by social media where information exchange should be unfettered and free. We should not be sailing in this open sea in "vessels we had designed for rivers", he said, referring to 'narrow' conditions and institutional structures that need to be changed. He said that people don't tend to trust these vessels and their captains to take them out into the open sea – a trend that is visible in the popular lack of trust in institutions of business today.

There is an ongoing debate about whether the government is good or not and whether business is better or worse, and the debate on the choice between State control and the free market has been re-opened, with the growing realisation that the latter is not necessarily the best option and that both need to be reformed. Technology has the potential to make governments truly democratic and open, he said, citing the example of electronic voting machines in India, even as elections in India continue to baffle people across the globe. The essence of e-governance being the delivery of public services, it s the communica-

> **We should not be sailing in the open sea of information in vessels designed for rivers, as people don't trust the captains of old institutional structures to take them out into this open sea.**

tion with people where governments find themselves most bewildered, he said. With the overload of available information, both citizens and governments are often equally out of touch with the other's thinking.

It was important, thus, to modernise processes, and not just to add a layer of technology to them, which is the real challenge before States. In that sense, it is not an IT problem, but one of institutional and process design. There is profit at the bottom of the pyramid, which is there for the taking if businesses can innovate at lower costs. The most important problem for India is the creation of jobs, so that people can earn enough to be able to consume products and services. Also, it is important to make people partners in progress, where they can be equal stakeholders and own what they produce, as part of a larger network enterprise. He concluded by asking the ICT community to keep these imperatives in mind, while keeping an eye on the outcomes as they innovate.

Dr. Kwon spoke about the legal challenges of open data and open government, using the Republic of Korea's example and the legal frameworks of digitisation, e-governance and IT infrastructure. He took the audience through the Korean government's efforts to facilitate and promote the use of public information by the private sector. He said that many countries had already made laws to make information available to people, that the developing nations have also been enacting laws like the 2005 Right to Information Act in India and that Korea had also enacted such a national legislation in 1996.

But he also cautioned that unless such infor-

mation that is sought to be provided is not well managed, it will prove to be counter-productive to 'open government', like if the government might not be able to find the information requested or takes too much time to provide it. Also, any online information, provided in an offline format, is of little relevance and use in an information society. Open government, he said, can only become a reality if the right to information can be provided at the front office, and the legal infrastructure is in place in the back office. All information must be available digitally, and e-governance seeks to promote such a policy.

He traced the development of four decades of open government in Korea through database building; the development of Korea's information infrastructure; and right up to citizen-oriented e governance initiatives from the late 1980s to 2007. Now, he said, it is the 'smartphone revolution' that has changed public information infrastructure as well as the lives of the country's citizens, helping Korea become a 'smart society'. Speaking about controversies with regard to the opening up of information, he mentioned the issues of free access to private parties, assigning responsibility for misuse and allowing people to profit from the use of public information.

In Korea, he said, the next steps included the 'Act on Promotion of Public Information in the Private Sector', which would recognise the industrial value of public information and prevent its discriminatory or malicious use. He ended by saying that the real next phase of open government is the age of public-private partnerships (PPPs), for the citizens of this information society.

Mr. Ravi Saxena began his presentation by

> **Unless information that's provided is not well managed, it will prove to be counter-productive to 'open government', like if the State is not able to find the right information requested or delays providing it**

underlining the importance of technology in governance, right from the days of the Industrial Revolution, saying that the current ICT revolution marks a similar watershed in history. He cautioned that unless governments can absorb and adapt the impact of ICT, they would find themselves out of sync with the aspirations of the people, in whose hands the power derived from this information must finally rest. He said that citizen-centric government was becoming obsolete and is being replaced by citizen-driven governance, thanks to the power of social media that is increasingly demanding more collaborative government. Thus, it is imperative for governments to realise this and adapt accordingly to ensure that this transition is orderly and does not leave them behind.

Within this backdrop, he said the key essentials of open government that require our attention included open standards, open data and open technology, with a focus on the principles of collaboration, participation and transparency. India's 10th Five Year Plan, he said, talked about India becoming a SMART State: Simple, Moral, Accountable, Responsible and Transparent, marking the start of the country's journey to e-governance. He said that though most federal and regional governments across the world have formulated Open Data strategies - government agencies are reluctant to implement these strategies, as per a study conducted by the Netherlands Scientific Research Organisation on the barriers to 'open government", reflective of the challenges ahead.

The first barrier is that despite fully-applied e-governance structures in most advanced countries

and with federal and regional governments having formulated open government strategies, most governments have not implemented these policies at the national level. There is a 'closed government culture' where government practitioners are rewarded for secrecy rather than openness. Even in India, till recently, the Official Secrets Act was treated as sacrosanct, with the government taking refuge under it for not furnishing any important information to citizens. Following on the lines of the SMART State concept, the Right to Information has made it possible for citizens to seek information from the Government of India, even though the quality, form and extent of that information is still questionable.

The second barrier is privacy legislations in different countries, which are used as a tool to deny information to citizens since the government cannot publish information that leads to the identification of specific individuals. All countries realise the tension between open data policy and ensuring the privacy of their citizens. The third barrier is the limited quality of data that is available, which is especially going to be a serious challenge for state and central governments in India. The fourth barrier is that there is limited user-friendliness and information overload, and technical experts in various advanced countries have asked for existing databases to be converted into user-friendly datasets.

The fifth barrier is the lack of standardisation of the open data policy, which India is now seeking to address through a new legislation. The sixth barrier, he said, is the entrenched closed culture and uncertainty about the side effects of making this data

> **The Government of India's 10th Five Year Plan talked about India becoming a SMART State: Simple, Moral, Accountable, Responsible and Transparent, marking the start of the country's journey to e-governance**

public. The seventh barrier is of security threats, especially in countries like the UK and US. The eighth barrier to openness is the existing charging models for this data. The Indian government has suggested this in the open data policy, so that certain data can be made available at a price to those who ask for it. The ninth barrier is uncertainty about the economic implications of all this. The last and very important barrier is that of the digital divide, as some countries are already moving towards making access to the internet a fundamental right. This is going to be, he said, "the most disruptive feature in the history of mankind". Also there are related issues like limited spectrum and network overload.

The path ahead should be unification and cleaning of all departmental data, leading to easy access and sharing between different government departments. This has been the basis of some unique and successful experiments undertaken in the Indian state of Gujarat, where geo-spatial data infrastructure has been created for social development projects and for integrating socio-economic data that can be of use across various government departments.

He also mentioned a PricewaterhouseCoopers study on the Right to Information in India where 75 percent of respondents noted their dissatisfaction with the information furnished under the Act as being incomplete, irrelevant and delayed, saying that there was a need to address this. He concluded by saying that the UID and the recently-notified National Data Sharing and Accessibility Policy are steps in the right direction. END

ICT FOR DEVELOPMENT

CHAIR

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MR. J SATYANARAYANA
SECRETARY, DEPARTMENT
OF ELECTRONICS AND
INFORMATION TECHNOLOGY,
GOVERNMENT OF INDIA

SPEAKERS ⬛

PROF. GEOFF WALSHAM
PROFESSOR OF
MANAGEMENT STUDIES,
JUDGE BUSINESS SCHOOL,
CAMBRIDGE UNIVERSITY,
UK

⬇

DR. NAGY HANNA
SENIOR FELLOW,
CENTRE FOR POLICY
ON EMERGING
TECHNOLOGIES &
SENIOR ADVISOR & LEAD
STRATEGIST, WORLD
BANK, USA
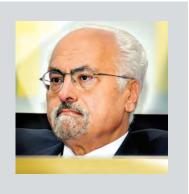
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SUMMARY OF THE DISCUSSION

The Chair, **Mr. Satyanarayana**, introduced the session by talking about an ICT for Development (ICT4D) project that was implemented by the National Institute of Smart Government (NISG), with the assistance of UNDP, during 2004-2009. The idea was to take large pilots spanning a good part of a state in India and ensuring that – whether it was education, healthcare, self-help groups or women empowerment – it created an impact in the chosen area through the use of some form of ICT. This helps in illustrating that ICT4D was a subject that has been tried in India and with some good results. He highlighted the importance of important issues in the context of ICT4D like strategies for poverty reduction, improving efficiency and transparency that can be brought in through the use of ICT. He said that, looking at the National e-Governance Plan (NeGP) itself, in retrospect, ICT for development has not been integrated into it in a very

conscious manner, so that in its Mission Mode Projects only about six of them touch, or fall into, the area of ICT for Development. Others use ICT for improving government efficiency or delivering public services in rural and urban areas. He suggested that both national and state governments, which are drawing up large and ambitious e-governance plans, could mandate that each and every such component of their projects should necessarily have a component of ICT4D consciously built into each component, perhaps setting aside a percentage of the funds toward the same.

He also suggested that for the institutionalisation of a concept like ICT4D, it is important to find ways in which pilot projects, which are often part of CSR obligations, are successfully replicated to create a larger impact. Another suggestion was to insist on partnerships in a multi-stakeholder environment where such implementations can be attempted with the help of civil society, NGOs and the private sector. He acknowledged the difficulties of doing this in large geographies as that of India and where other barriers like lack of infrastructure, illiteracy, unemployment and poverty are prevalent.

Prof. Walsham started his presentation by recalling how, about two decades ago, a lot of people in India maintained that computers were not relevant to India, illustrating how all the major technological changes since 1982 had not been forecast, including the massive explosion of mobile phones. His presentation was focused on five lessons that he identified as those that had been learnt over the last 30 years, particularly in academic research.

As the first lesson, he talked about there be-

> **There are no silver bullets that technology could provide, given the many technophiles working in this area– he felt obliged to provide a counter argument that technology was not the answer itself.**

ing no silver bullets that technology could provide, saying that – given the many technophiles working in this area – he felt obliged to provide a counter argument that technology was not an answer in itself. Citing an example of the National Rural Health Mission in India, he said that though ICT had a very valuable role to play in healthcare, for collection, analysis and dissemination of data, but that any initiative was valueless if not accompanied by other major changes. Without increased resources, like those spent on healthcare, technology is not going to sort things out. For example, data collection in itself cannot bring about any meaningful change unless the collected data is put to good use. Technology may be great, but there is a greater need to bring about a change in people's attitude, which is more difficult to achieve.

The second lesson, he said, was the need for long-term commitment. He said that, in research, two or three years is nowhere long enough to look at things if what we are trying to do is to make some fundamental changes to systems, whether in health, agriculture or e-governance. Long term commitment is measured in decades and not in years. He did acknowledge that those things that can be changed quickly, termed as low-hanging fruits, should be changed but the same cannot apply to programmes undertaken by governments or aid agencies, which require longer-term commitment. He cited the example of the health information systems programme in South Africa, which has achieved considerable success over a 15-year period. He said that though it was important to work extremely hard over the short and medium term, this needed to be part of a long-term strategic programme.

He said that in a country like India, as in the rest of the world, there are so many changes that disrupt longer term programmes, including political changes. Often programmes that have started fall apart, or are stopped while others are started, which is a major problem to the long term commitment that is needed. His third lesson, he said, which is also relevant to the future is that ICT is inter-disciplinary. The field of ICT for development is an academic field, which is about 25 years old. He said that though we need computer scientists, they have certain weaknesses as a tribe – a certain blindness of human organisational social issues and an enthusiasm for technological solutions. So we need anthropologists as well as the technologists, for example, so that people can look at what actually happens in the farming community when technology is introduced. We need people like the anthropologists to complement the messages from the computer scientists. He said he found it very interesting that development studies used to completely ignore technology, and that there was still a bias in development studies regarding technology. He said this was changing with the realisation that ICT is important to their area.

As his fourth lesson he identified the need for an explicit focus on the 'D' for development. He said that a more sophisticated view of development was needed, than the idea of it 'trickling down'. Trickle down, he said, was a very comfortable and convenient argument for the rich, though it has been devalued due to the fact that the trickle down hadn't happened. He cited the Nobel prize-winning Indian economist Amartya Sen's work, saying it provided a much broader view of development, focusing on Sen's

> **ICT is inter-disciplinary. We need anthropologists as well as technologists, for example, so that people can look at what actually happens in the farming community when technology is introduced**

argument that we should focus on the 'increased capabilities and freedoms for the poor'. Mobile phones provide a good example of Sen's ideas, he said, which talked about how we should offer poor people things that they value and those which provide them freedom – shifting the focus on what is perceived by the people themselves to be valuable to them – which is a more sophisticated view of development. His final lesson, he said, was the need to construct a strategic research agenda, saying that we have boot strapped ourselves by certain divisions like those of the conference's four themes.

One way of doing this was to expand the agenda to include things like human infrastructure, besides talking about physical infrastructure. A second area for strategic action, he said, was the promotion of social justice, as there is enormous interest in how we can use technologies in order to enable the poor and help them in obtaining appropriate justice. A third strategic example, he said, for supporting economic activity for the poor was an effective banking system, like the m-Pesa in Kenya. He said that given the banks' lack of enthusiasm about the poor, the banking system for the poor has come in through the backdoor. He said we need a strategic agenda which sees ICTs as important in all areas of activity and particularly in activity aimed at development for the poor.

He ended on an upbeat note, by paraphrasing Robert Chambers, the guru of rural participation. He quoted Chambers as saying that there is a cornucopia of potentials through email, internet, video conferencing, participatory GIS, mobile phones, SMS, blogging, Twitter and beyond; and a whole new domain of participatory interaction has opened up. He stressed

the importance of a traditional rural-participation person seeing these new technologies as offering enormous opportunities. He mentioned how Chambers talked about the runaway potential of new combinations of technology and volunteer commitment, energy and creativity being empowering. He ended by saying that he shared Chamber's excitement about the potential of technology to revolutionise development efforts aimed at the poor, and with the hope that WITFOR would make a small contribution towards moving in that direction.

Dr. Nagy Hanna made a presentation on the kind of development that can be facilitated by ICT, with a look into the future. He began his presentation by saying that people in multilateral institutions like the World Bank tend to look exclusively at macroeconomic development or development economics, with little or no appreciation of IT as an important area for development. Thus it behooves on us, he said, to try and articulate its importance.

He said that he had come to India in 1990 for a major study of the country's ICT export strategy and after its completion had proposed another one on looking at ICT as an enabler for development. This was based on the hurdles he saw then – including the non-reliance of decision-makers on IT and shortages of power – only to have his idea rejected by the Bank. But, he said, he now sees a sea change in attitude, testified by the deliberations at WITFOR 2012, even though the change seems limited to only those who are committed to IT. He said that we still tend to see development 'backwards', as IT is still under the radar and not an integral part of development thinking.

There was a need to take it much further to be able to ask tomorrow's questions today, by increasing

The vision for such development needs to be grounded in understanding the technological revolution, which has no historical parallel except, perhaps, in the Industrial Revolution.

the focus on the common challenges facing the world. He underlined the need for a changed understanding of growth and development, which has information, experimentation and knowledge at its heart. He talked about 'open, smart and inclusive development', which is about structural transformation and is more knowledge-intensive. Development, he said, is also about freedom and understanding this involves a greater role of IT under each of these different heads.

The vision for such development needs to be grounded in understanding the technological revolution, which has no historical parallel except, perhaps, in the Industrial Revolution. It has led to an unbundling all across the supply chain, which has been enabled by the use of IT. This has also helped empower communities and fostered greater participation, where certain economies have displayed great progress by deploying IT more strategically. Thus, it is important to include IT in the highest levels of dialogue, especially when dealing with issues of development, and to acknowledge the ability of this tool to revolutionise various sectors.

There is also a need to increase the focus on new transformative technologies that are making development programmes more adaptive, even as new paradigms are making development more participative and putting new areas of collaboration on the map. ICT is crucial for building and empowering communities by helping them become more interconnected, even as it is helping transform government, institutions and services. Open, smart and inclusive development is, thus, about shaping the future of development with the help of the ongoing ICT revolution.

A more open and dynamic economy can be created, he said, with the help of ICT that facilitates knowledge-sharing and helps to foster a collaborative and open government. Open, smart and inclusive development is also about open platforms, social media, crowd sourcing, open ideas and celebrating diversity, which is especially relevant in a country like India. It is about smart development and sharing of services, based on sharing feedback with clients, as much as it is about mobilising clients and services through networks and shared knowledge, smart infrastructure, smart grids and smart resource management. The world is facing a major challenge from growing inequality, even as there is greater automation of workplaces, which is causing obstruction in maintaining inclusiveness and equality – both in the developing and developed countries alike.

He said there was a need to re-think government of the 21st century, as there's an increasing demand on governments to deliver more with less and less resources. This new type of government would have to put ICT as an integral part of the development process and governments would also have to provide a platform for greater collaboration, innovation and better service delivery. It will have to work with other stakeholders for the delivery of e-services. Thus, it is important to engage communities in a participatory way because citizens increasingly wish to become a part of the development process.

Another aspect of open government, he said, is the co-creation of services and public data, which is a process of mutual learning and knowledge-sharing. It is about transparent resource management, like the

Open, smart and inclusive development is also about open platforms, social media, crowd sourcing, open ideas and celebrating diversity, which is especially relevant in a country like India

experiment with an open budget, which was conducted in a village in Brazil. He gave the example of Kenya, where ICT was used to monitor the parliamentary policy-making process. This can help monitor both progress and crises, like via mobiles, and can help in improving not just government to citizen services but also those that are government to business, while improving overall service delivery. It can also contribute to smart and inclusive growth and help the development of local content. He said that one of the more ignored areas of focus is the role of ICT in making small and medium businesses more competent and internationally competitive. Inclusive and smart growth can be extended to smart infrastructure and for building a sustainable economy, through more informed decision-making with human development being instrumental in making this possible, which, in turn, has to rely on innovation and knowledge. In conclusion, he said, the key fundamentals of this are: the systematic and meaningful integration of ICT in the development strategy; building and strengthening leadership at all levels and the integration of innovation at all levels. The role of ICT needs to be tested in different contexts and the same has to be integrated strategically to usher in meaningful change. There is a need to search for local solutions for all of this to be possible, and to ensure that they are mutually reinforcing. END

NETWORKS - CONNECTING PEOPLE

CHAIR

MR. R CHANDRASHEKHAR
SECRETARY, DEPARTMENT
OF TELECOMMUNICATIONS,
GOVERNMENT OF INDIA

SPEAKERS

MR. DAVID HUME
EXECUTIVE DIRECTOR,
CITIZEN ENGAGEMENT,
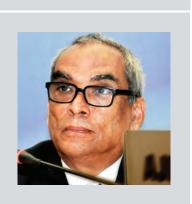GOVERNMENT OF BRITISH
COLUMBIA, CANADA

AJIT BALAKRISHNAN
CHAIRMAN AND CEO,
REDIFF.COM

SUMMARY OF THE DISCUSSION

Mr. R. Chandrashekhar opened the session by commenting on how we are increasingly using modern technologies and techniques of connecting with people, in a world where things have changed dramatically in the past decade or so. He talked about how governments are increasingly using social media to reach out to and mobi-

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FORMER PRESIDENT,
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MS. CAITLIN WIESEN
COUNTRY DIRECTOR, UNITED
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PROGRAMME, INDIA

lise citizens, like the Indian Ministry of External Affairs used Facebook to evacuate Indian citizens from Libya. New technologies and social media platforms have changed the very nature of human communication, even as others bemoan the diminishing quality of the same. This is especially crucial in democracies like India, where the social media and the government often have fundamentally opposite characteristics, and there is a need to reconcile the two. This is because there is a huge difference in using social media as an individual and as part of the government in a position of responsibility. This also gives rise to various questions like why, how and when to use social media. From the government's point of view the most important is to figure out the rules of engagement as government, by nature, is highly structured and decision-making is very complex in a set-up where nothing is final and there is a need to balance early, less-informed reactions with delayed ones. But good governance definitely requires greater interaction with citizens, especially in India where legislations touch over a billion people.

He cautioned against the limitations of social media, saying that it represents a very small fraction of the people who are already connected and hence empowered to an extent. Realising both the opportunities and challenges presented by social media, the Government of India is seeking to increase mobile connectivity across rural India, because even as India has nearly a billion mobile phone subscribers, there is a problem of quality of service and access in remote areas. The Departments of IT and Telecom have already notified a framework for mobile governance, making it mandatory for government departments to use the mobile platform for de-

signing e-governance solutions.

Mr. David Hume talked about how the Government of the province of British Columbia in Canada is experimenting with social media, and combining the same with face-to-face interactions with people for policy development and implementation. He said that in a world where there are a plethora of complex issues, as well as increasing pressure on resources, it is important to collaborate with those who can offer innovative ideas to find holistic solutions. In Canada, he said, there is an educated populace that is demanding answers from the political leadership, and there is now an opportunity to co-opt their ideas by leveraging the amazing interconnectivity provided by the Internet. He talked about how policymakers and others have been meeting behind closed doors and talking, often predictably, about the same issues.

It would be interesting, he said, to explore the possibility of how this could be done differently, which was the idea behind the initiatives at the Government of BC. He gave examples of some of these initiatives like involving people in a project on education, where parents and students alike were involved in the discussion to improve the education system; as well as the 'BC Jobs Plan' project, which cuts across sectors, and which involves profiling economic opportunities and encourages people to pose questions about key policy initiatives that are required. Here administrators can tap into vast amounts of expertise gathered via discussion forums.

Integrating different social media

> **Social media comes attached with limitations as it represents a very small fraction of the educated and 'connected' elite, of which only about 1–5 percent generate any real content, while a majority are passive observers.**

platforms has helped create more transparency in the process and has led to a better alignment among people that are involved in policy development, while helping to identify gaps in the same. He also mentioned some of the problems and risks that are attendant on the process of such collaboration, the most important of which is the establishment of trust. He said that the establishing of trust has been a crucial element of success, as has been the official support that has gone into the planning process. He said that such support has been in the form of providing business templates for people and support to those who the Government of BC is collaborating with.

Another important factor, he emphasised, was project evaluation for better learning and knowledge-sharing and for developing lasting partnerships with practitioners across government, which rests on identifying innovation leaders across departments and sectors. All this has been brought together in an online resource for people, which is available across public services, to provide support to them for the optimum use of public resources. He invited everyone to access the same at https://extranet.gov.bc.ca/collab/some/ with the ID 'extragov' and the password 'Engage4all'. He shared these details to invite feedback, suggestions and discussion and also invited everyone to reach out to him at David.Hume@gov.bc.ca to invite ideas from all those interested in knowing more about the Government of BC's initiatives.

Mr. Ajit Balakrishnan said that it would be wrong to think that social networks were a

new development, as the practice of referral and suggestions by 'asking a friend' had been around from time immemorial. What has made it different in the last decade, however, is the emergence of low-cost networks and affordable devices that have made such referrals easier and liberated us from geography, enabling us to reach out both nationally and internationally. Thus, what we do as part of social networks is also what we do outside of them. He said there is now tremendous enthusiasm to find out more about the impact of these social networks among techno-enthusiasts, latercomers and academics alike.

Interestingly, and significantly, what is common across all social networks is that only about 1-5 percent users create content, while only about 5-10 percent comment on or forward the same, even as the vast majority (about 80-90 percent) only watch the action. When we juxtapose this against the idea of empowerment and democratisation, it is much like cricket, where only 22 people play, about 3000 journalists report it, and over 220 million do nothing but watch! All media, he said, works the same way. Countries like India, which have very low broadband penetration, the concerns of this 1-5 percent of active, 'elite' users are far removed from both the majority of Indians and policymakers alike. He cited the case of the Egyptian unrest, where social media posts were hyped by the Western media to an extent where it turned out not to be representative of the political ground reality at all. This is also because those who use smart devices are a small minority.

Integrating different social media platforms can help create greater transparency in the policymaking process, leading to better alignment among those involved in policy development, while helping to identify crucial gaps in the same

Another important thing to note about social networks, he said, was the 'tipping point' phenomenon, which is achieved when these networks first get 10-15 percent traction and then tip over into 80-90 percent in no time at all. This, he said, was the 'network effect' where there are increased benefits for one person if there are others like that person in the network. This is also why the US-based networks are globally dominant, because they have created a large national network of 'early adopters' and have managed to quickly gather critical mass.

Here, he said, it is important for the government to understand that network effects work on demand-side economies of scale, instead of on supply-side economies of scale, which is what most current competition policy is based on, and that this change is not yet reflected in the thinking of most policymakers. Another important thing, he said, is that, worldwide, social networks are on a collision course with the simple organising principle of the nation state, whether in India, China, UK or the US – as evidenced by the different attempts of the State to curb internet freedom. Importantly, he said, that while most current services are word-based – and assume a basic level of literacy – experiments are moving increasingly towards voice-based applications, which have the potential to leap over constraints like those posed by the language or literacy barriers.

This, he said, should be the goal of a national mission, and for those seeking the democratisation of the internet and expanding the

reach and use of mobile phones.

Mr. Kiran Karnik said that face-to-face interactions – or 'facings' as he called them – were a dying breed, and what is gaining prominence instead are simple applications that are easily accessible, affordable and interactive. There is a big gap between the existence of information and knowledge and those who need to use the same, which is where there is a need to bridge the information gap. This is because this information asymmetry leads to lots of socio-economic problems and there is a need to make information more inclusive and equitable. This, he said, is now being done via very simple applications. Though there may be limited or patchy connectivity in India, the fact that there are almost a billion mobile phones can ensure that even a simple application can have a huge impact on the ground.

He said that 'reach' and 'access' were more important today than technologically sophisticated applications, which has a much bigger multiplier effect and leads to a host of advantages. This is being made possible by a new entrepreneurial energy, new networking technologies and easier access, which is helping countries like India move beyond pilot projects to scalable models, which are helping service less 'sophisticated' customers. This is also changing the face of democratic engagement. No longer are people merely asking for information, but they are now voicing an informed opinion as well as reacting to the information that is available or being demanded.

An even newer change, he observed, is the increasing ability to mobilise. Feedback is getting captured in a more systematic way and being

> **Social networks are on a collision course, worldwide, with the organising principle of the nation state, whether in India, China, UK or the US – as evidenced by attempts of the State to curb online freedom.**

used to develop a mobilisation framework, which is crucial in a democracy, so that people are not just voicing their own opinions, but are helping others find their voice via greater mobilisation of opinion. But governments are also faced with newer concerns about individual privacy, the veracity of information being shared, broadcasted or exchanged and the half-truths that are sometimes being passed off as fact, even as governments themselves are too sensitive sometimes.

Thus it is important to find ways to take care of such issues, which are no longer contained by national boundaries and are trans-national in nature. Also, how will countries make those who are outside their national jurisdiction, liable? Another important social implication of this is the distortion of reality where there seems to be a blurring of 'real' and 'virtual' boundaries. He ended on a positive note by sharing an example of highly successful crowd sourcing from India, for open-source drug discovery. He said that the success of this experiment demonstrated how social media can be used for productive and constructive purposes.

Ms. Caitlin Wiesen focused on the role of UNDP as a global network that connects people across the globe, in various sectors and positions, to share knowledge and find transformational solutions that can bring about change at the community, local and national levels. This, she said, was aimed at strengthening key national and Millennium Development Goals. The UNDP seeks

to engage, she said, with different stakeholders via its various community-specific initiatives and the use of ICT for sustainable development has, at its heart, human development as the overarching goal. It is focused on enlarging people's choices and access, while fostering greater participation.

She talked about how ICT is re-shaping the development agenda and how the UNDP has also been investing in systems and capacities to become a knowledge-sharing network to be able to reach out quickly and devise timely policy interventions. ICT can help leverage shared experiences and lead to timely course-correction, as well as provide for much more active and interactive policy implementation. The UN started an email-based knowledge network in India in 2005, which now has over 30,000 members and the success of which has been replicated in five other countries since then.

Known as 'Solutions Exchange', ICT has made this network highly cost-effective and has enabled UNDP to reach beyond national boundaries, across sectoral divides, while preventing the re-invention of the wheel and engaging sectors and communities that are usually excluded from the policy-making process. For example, this network has been instrumental in providing feedback to the Planning Commission of India for its Five Year Plans. It has provided a vehicle for local expertise to be shared and leveraged for providing better solutions, as it is easy to access and is an impartial service that can be used to rope in marginalised communities.

That said, she emphasised the fact that face-to-face interactions were still important and could not be replaced by online platforms. Also, to reach out to marginalised communities and groups, it was important, she said, to leverage voice-based services, which can reach out to the differently-abled, non-English speakers and the illiterate.

Networks such as these have increased the avenues for collective bargaining by these hitherto marginalised groups and communities that are now benefitting from transparent platforms for engagement. There is a need to better understand these groups and build solutions for them. Thus, much more needs to be done by governments to build upon the momentum that has already been gained, and the UNDP sees ICT as a means of enhancing and advancing human development through a range of networks, which can provide greater opportunities for empowering those at the bottom of the pyramid. END

POLICYMAKERS' PANEL

CHAIR

MR. J SATYANARAYANA
SECRETARY, DEPARTMENT OF ELECTRONICS AND INFORMATION TECHNOLOGY, GOVERNMENT OF INDIA

SPEAKERS

MS. MARGARITA ROJAS
MINISTER, ICT PLANNING, REPUBLIC OF PARAGUAY

MR. BONG-SOO KEUM
EXECUTIVE DIRECTOR, NATIONAL INFORMATION SOCIETY AGENCY (NIA), REPUBLIC OF KOREA

SUMMARY OF THE DISCUSSION

The Chair, **Mr. Satyanarayana**, talked about how conferences like WITFOR provide an opportunity to stop and think, and to look back at things that have not gone so well, as also to formulate new policies or make mid-course corrections. He said that, at the national level, there was need for an ICT policy that defines how ICT has to be used in different ways by each country and that – surprisingly – there was no formal documentation of the ICT policy at the national level in India even though it exists at the state level. He said that there has been an attempt to put together a document over the last few months, which is at a consultation stage. He said that we need policies that encourage the use of ICT in various segments like manufacturing, services, medicare, the automotive industry, besides just for government usage. Policymakers have to think of mainstreaming of ICT into the development agenda. Policy-level thinking should also be on how to create

DR. IVAR TALLO
MEMBER, EXECUTIVE
BOARD, E-GOVERNANCE
ACADEMY FOUNDATION,
ESTONIA

the core infrastructure that is required to span the length and breadth of the country. He also emphasised how the Right to Service was as important as the Right to Information or Education, saying that policy should address this level. No ICT programme can succeed if there is no political will at the highest level. It is the leadership at the top that will make or unmake a programme so it is important to sensitise the top-level political leadership.

Ms. Margarita Rojas talked about Paraguay and its policies, saying that its current rate of unemployment rate was seven percent, under-employment rate 20 percent, internet connectivity in health 20 percent, internet connectivity in education 6 percent and the level of poverty and extreme poverty 19 percent. According to Paraguay Vision 2020, she said, they had plans to concentrate on the good quality of life, social inclusion, ending poverty and inequity, economy development without exclusion and institutional strength and efficiency in social investment. To accomplish these goals, she said, Paraguay has an ICT Master Plan, which has been established to reduce the digital divide and to strengthen the state and local industry by the usage of ICT. For this Master Plan, she said, they have taken technical cooperation from the Korean Government. The ICT Master Plan of Paraguay states that it is a road map that allows the development of a strategy where ICT turns into an essential path to achieve sustainable development. The ICT Master Plan includes ten important things, namely, e-government, infrastructure, HR development, research and development, ICT industry, e-commerce, ICT standards, ICT awareness, legal framework and ICT organisation. In terms of priorities in 2012, Paraguay has included infrastructure, e-governance, open governance, economical development and HR training and awareness as well.

Dr. Bong Soo Keum talked about the mobile penetration in Korea as well as wireless devices.
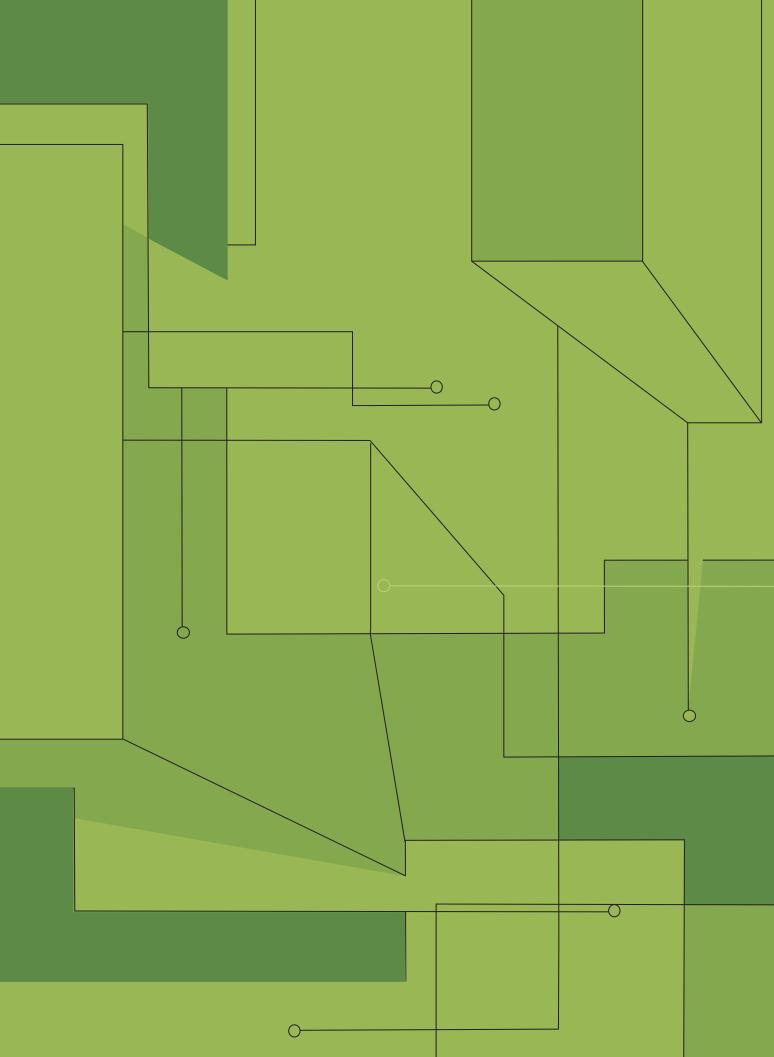
After the introduction of iPhones in Korea in November 2010, he said, the usage of wireless Internet and smart phones has dramatically increased. The number of subscriptions of smart phones, which was at 10 million in March 2011, increased to 20 million in December 2011. In terms of smart phone services, Korea has 590 services, out of which 252 are mobile web services and 393 mobile application services. From 2006 to 2009, the first-generation mobile government service was based on SMS and MMS. In 2010, the second-generation mobile governance is being promoted to respond to the big changes caused by the increased usage of wireless internet and the diversification of mobile devices such as smartphones and smartpads.

The Korean government has also developed various applications for healthcare which the people can use anytime, anywhere. Some of the information available includes vaccine information, volunteer work, health information and health statistics. The Korean government has also created an application which enables its citizens to find out everything about the law, different acts and regulations. There are more than 2,50,000 cases that can be accessed online. In February 2010, the Korean government opened a site where people can access policy information and news. Now the Koreans can reserve train tickets anytime, anywhere through smartphones, thanks to the government's initiatives for creating relevant applications. Talking about useful lessons and their implications, he said that the Korean people today have service upgrades right from information retrieved to administration services (issuing official documents), saying that the common mobile security infrastructure is cost-effective and highly reliable, though the Korean government has realised that mobile services are vulnerable to hacking and is working toward new ways to verify safety.

Dr Ivar Tallo addressed two key issues: e-Estonia and the policymaking process. He reminded everyone that Estonia was a very small country in a cold Nordic neighbourhood with a population of 1.4 million people; is now a member of EU and NATO since 2004 after regaining independence from the USSR in 1991 and had adopted the Euro in 2011. In the last 20 years Estonia has witnessed very good development, which is strongly rooted in the ICT development in Estonia. The internet penetration rate in Estonia is 76 percent, 98 percent of people in the age group of under-35 are frequent internet users, it has a fully-functional e-government infrastructure and a seven-year track record of complex e-services provision. Ninety two percent of personal income tax declarations are submitted online and it has e-voting on all elections since 2005. Another interesting fact about Estonia, he said, was that Skype actually originated there.

What made Estonia special, he said, was that it has a fully-functional e-governance infrastructure, which includes digitised information – information systems and databases in all levels of government; formalised exchange – the connection of government databases by a data exchange server layer; and electronic identity – authentication of a user by a digital certificate embedded in the ID card or SIM card. The reason for Estonia's success, he said, was the general support for ICT-led development among the main forces in Estonian society, the commitment of political elites, the right mix of private and public initiatives, active role of the government, project-based development and little baggage of previous practice.END

Agriculture

CONTENTS

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?

espite 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 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, when combined, may be shared more widely. Digital libraries can be created to integrate widely scattered references to Indigenous Techni-

cal 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.

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 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 (WKCs) in four regions of Ethiopia, namely, Amhara, Oromia, SN-NPS, and Tigray to promote the productivity of farmers starting from 2005. These WKCs are expected to provide the local farmers with reliable, relevant, and timely agricultural 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 efficient 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 are 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 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.

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IS THERE HUNGER FOR INFORMATION TECHNOLOGY IN AGRICULTURE?
FROM GREEN REVOLUTION TO IT REVOLUTION

Mrs. RITA TEAOTIA
ADDITIONAL SECRETARY,
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ELECTRONICS &
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SUMMARY OF THE DISCUSSION

Mrs. Rita Teaotia's presentation was on "Harnessing IT for Rain-fed Agriculture: Signpost For a Green Revolution". She talked about the use of IT tools to support rainfed agriculture, to meet the increasing demand for food and water conservation in rainfed areas, which can result in high growth. The rising demand for food in the coming decades will make India dependent on rain-fed areas to help increase supply, and water conservation in rain-fed areas has contributed significantly to the high growth rate of agriculture in Gujarat in the last decade. She talked about how the application of new technological tools in rain-fed agriculture has opened up new avenues for development through watershed management and how watershed management can help better manage natural resources, conserve water, improve land, provide ecological and water security, increase agricultural productivity and lead to sustainable development.

Watershed security, she said, was imperative for sustainable development, as only 35 percent of all cultivable land is under irrigation, with the Green Revolution being limited to irrigated areas. This is where scientific watershed management, combining rainwater harvesting with modern agricultural practices to optimise the potential of rainfed areas, can alleviate poverty, hunger and distress.

She talked about the case of Gujarat, and the state's strategy for rainfed agriculture. In Gujarat, watershed management involved the improvement of extension and technical services, like through an effective Lab-Land Programme, Soil Health Cards; and in sustaining the gains through initiatives like eight hours of power through "Jyotigram", micro-irrigation; and Kisan Credit Cards. This was bolstered by support services to farmers through IT, like crop advisories and crop insurance, weather forecasts, market updates and spot prices. Mobile-based monitoring was done through a GIS system, along with the use of tools such as GIS maps, satellite imagery, mobile-embedded tracking systems, multi-temporal remote sensing, GPS, hydrological modelling and via the E-gram (e-village) project.

The GIS data sets that were used, she informed the audience, included data on land, water, vegetation, village demographics and infrastructure and ownership details. This involved scientific planning and prioritisation up to 18 years, right up to the 14th Five Year Plan that would end in 2027, based on a converged system of budgeting. Satellite imagery, mobile-based tracking and web GIS, that have been used to monitor and evaluate the projects constantly.

She concluded her presentation by saying that these scientific interventions helped enable the

identification of the areas requiring the most attention in the initial years; helped generate trust, confidence and ownership among people; proved to be a cost- and time-efficient process due to the technically-appropriate selection and location of physical interventions, and through the use of tools like GPS. It also helped foster transparency and has proven to be scalable.

Ms. Aurelia Bondari talked about ICT as an efficient tool in agricultural marketing and training on agricultural business development, using Moldova as a case study. She said it was important to help unite farmers for fostering greater cooperation. She said that, through the online marketing information system, farmers are more willing to discuss their problems, but often do not prefer to talk explicitly about their information needs. Thus, there is an urgent need for information technology in agriculture, given the necessity of better access to market information and for compiling and managing information.

The National Federation of Agricultural producers from Moldova, "AGROinform" – is a network of 15 regional NGOs aimed at rural economic development trough lobbying farmers' interest and offering complex assistance in farmer cooperation, business development, marketing and applying advanced technologies. The target audience for this comprises of farmers, traders and wholesalers alike. Daily market news, she said, is created on the basis of information received from clients, regular marketing advisors, statistical information, price monitoring etc, with countries like Ukraine, Russia, Romania and Poland providing weekly price infor-

> **Scientific interventions can enable the identification of agricultural areas requiring greater attention, generate trust, confidence and ownership among people and be cost- and time-efficient with the use of tools like GPS, while fostering transparency.**

mation. Offers and bids are generated by clients directly via the database and regional marketing advisors. Both monthly and daily newsletters in print and electronic versions are sent to subscribers, the latter via email. In addition to this, the newspaper *Agromedia Inform* publishes offers and bids. Farmers do not prefer to talk about their information needs and they are not very explicit in discussions on the subject of the use of ICT in agriculture. However, they are very willing to discuss their problems and always expect professionals to come to them with adequate solutions, especially when these problems are related to domains other than production. But if the proposed solutions are good they are very eager to use them, and this is mostly proved in agricultural marketing, since market globalisation has put great pressure on the farming communities of countries like Moldova.

She informed the audience that in the period 2010-2011 the number of MIS visitors increased yearly, showing an average growth of 15 percent, while 7382 commercial offers have been placed on the MIS portal along with 1582 contacts and contracts that have been established through the system. Also, she said, 716 transactions have been made to the value of €4.8 billion by the system users, advocating the integration of the national MIS into regional information systems.

[For her full presentation in two parts, please go to http://bit.ly/LQ2bnQ and http://bit.ly/OkwC1N]

Prof. Ashok Jhunjhunwala talked about the information gap in modern agriculture. He said that,

as compared to traditional farmers who were dependent on local markets, modern farmers need better access to technology and, given their large input costs, also have a greater need for finance, including for better and more efficient agricultural machinery. The price of agricultural products has been affected by global warming.

He talked about the changing needs of modern agriculture in which extended services could only be generic and where farm-specific inputs are required. Enhancing agricultural output and farmer's profits require farm-plot specific advisory, based on a farmer's financial and risk-taking ability. Farmers need to know what to grow, based on information regarding soil type, the expected market price and margins for crops, information on seeds, fertilizers – their availability and optimum use – as well as inputs that are available. They also need stage-wise growth phase advisories, which can be facilitated through modern call centres for farmers through which customers' data is captured, and via past interactions and complete service history where information is available. This also enables multi-party interactions enabling escalation, an interactive multimedia agriculture advisory system and voice-based services.

Modern farming techniques have created an Information gap where knowledge lies not with farmers, but with agri-scientists. An Integrated Multimedia Agriculture Advisory System helps create webpages for each farmer's plot, using over 300 parameters, where pest and disease images can be uploaded and advisory timelines can be shared, for

Modern farming techniques have created an information gap where knowledge lies not with farmers, but with agri-scientists. Enhancing agricultural output and farmers' profits requires farm-plot specific advisories, based on a farmer's financial and risk-taking abilities.

example, through a farmer-specific dashboard. Escalation is possible, where any problems that cannot be solved by an advisor can be referred to specific crop, market or finance experts. Mitigation of risks is also possible, he said, with regard to crop diseases, rain-fall measurement and prediction - also through a low-cost Weather Monitoring Kit, which can collect and upload (using GPRS) information on temperature, humidity, pressure, wind speed, wind direction and rainfall in each village. Market risks can be better managed through the use of commodity exchanges, forward pricing and other such options.

He shared the example of a Government of Tamil Nadu, India, initiative, where a farmer can call the Farmer Crop Management System using a mobile phone or fixed line, where the system interacts with the farmer in the local language (Tamil), to capture the relevant information. Also, he told the audience about some new IIT-Madras initiatives like the DC Solar-PV driven agricultural-pump, which, when the sun is stronger, pumps more water, is dimensioned to use solar power correctly while the sun is up for ten hours (as opposed to the rural electricity grid), and which is connected with drip-irrigation to conserve water. END

[For his full presentation, please go to http://bit.ly/N4hhhM]

CAN ICT BENEFIT THE SMALL FARMERS?
PUTTING FARMERS FIRST

CHAIR

Mr. VIKAS NATH
ASSOCIATE DIRECTOR, FUTURE OF THE UNITED NATIONS PROJECT, SWITZERLAND

SPEAKERS

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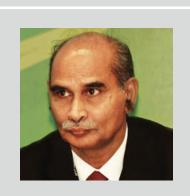
DR. T.P. TRIVEDI
ASSISTANT DIRECTOR GENERAL, INDIAN COUNCIL FOR AGRICULTURAL RESEARCH, INDIA

SUMMARY OF THE DISCUSSION

Dr. T P Trivedi talked about some of the initiatives taken by the Indian Council for Agricultural Research (ICAR), which seeks to reduce information gaps and enhance knowledge sharing between agricultural experts, farmers, scientists and students. These include a centralised, secure datacenter; a National Agriculture Bioinformatics Grid; e-connectivity to Farm Science Centers, called the Krishi Vigyan Kendras (KVKs); a mobile-based advisory system; mobilisation of mass-media support; e-courses and a consortium for e-resources in agriculture; a national knowledge network and the introduction of a uniform e-mail ID. The ICAR website, he said, had over 2.5 million visits per year and has a Google page rank of 7/10. The Consortium for e-Resources in Agriculture (CeRA) is connected to 142 universities, subscribes to 1687 journals and is a hub of activity and information aggregation and dis-

DR. RAJ SARAVANAN
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semination, he told the audience. *[For his full presentation, please go to http://bit.ly/LQ1TFN]*

Dr. Harsha de Silva made a presentation on 'Can ICT benefit small farmers? Tackling the Smallholder Quality Penalty'. He talked about how large farmers have the capacity and money while the smaller farmers don't, and presented the synthesis of findings of six smallholder-focused ICT and agriculture supply chain studies in three countries. These included mangoes and pomegranates in India; jute and potatoes in Bangladesh and rubber and pineapples in Sri Lanka. He said that there was a perception of lower quality leading to lower price, and that the smallholder challenge is to overcome quality constraints (both real and perceived) to integrate on more favorable terms.

He said there was a 'Smallholder Quality Penalty' (SQP) – a financial penalty imposed on the smallholder by the first handler of the produce. This amount is collected by the first handler – to be used, in total or in part, if called upon by the second handler downstream to compensate. The SQP is not only between smallholder and first handler but can also exist at every transaction throughout the supply chain. The 'quality' of produce, he said, was the totality of attributes and characteristics of a product that contributes to its ability to satisfy specific or implicit requirement.

He said that there was a need to reduce subjectivity in determining the same and, for this, implementation of standards and communication was the key to establishing trust. Using ICT can help in communicating standards, with adherence all across the supply chain, through frequent, accurate and cost-effective communication. This must be developed internally and grow over a period of time, helped by a greater frequency of interaction between smallholder and collector, which would lead to greater trust. In differing

market structures there are disaggregated smallholders and atomistic market conditions, which include the out-grower or contract farming model as well as smallholder farmer associations in a structured format. Further, in atomistic markets there are a large number of smallholders, who are exogenous to the supply chain and collectors. In reality this is more of an oligopsony structure with limited number of buyers (first handlers) and smallholders have very little power, and it is very difficult to effectively communicate 'better quality'. In outgrower schemes, which represent the top-down model, purchasing entities down the supply chain create larger entities upstream. Here the smallholder is endogenous, or inclusive, and cannot be 'seen' from the outside. Authorised representative of the processor enters into agreement with a smallholder and transactions are governed by the rules of the upstream entity. Participants along the supply chain are protected, to the extent possible, from market risks that are shared. It is possible to communicate 'better quality' and build trust and adherence to agreements and standards. Moreover, ICT solutions are implementable along the administrative structure, there is traceability and the processor agent can keep smallholders in the system via incentives.

Smallholder farmer associations, which represent the bottom-up model, maintain individual ownership of assets but yield control of processes of production and marketing to the association. Here the smallholder is endogenous and cannot be 'seen' from the outside; it is the col-

Using ICT can help in communicating standards, with adherence across the supply chain, through frequent, accurate and cost-effective communication. This must be developed internally and grow over a period of time, helped by greater interaction.

lective that has to be dealt with. Members are bound by internal rules and regulations on produce quality are determined by the association and there are binding quality benchmarks. A common problem here is of free-riders, those who benefit from being in the association but do not contribute to the common objectives. It is, thus, difficult to keep together due to greater politicisation. Effective leadership can make it possible to communicate 'better quality', built trust and address the free-rider problem via ICT solutions. This also 'binds the virtual organisation together'.

Summarising, he said that the Smallholder Quality Penalty was blocking the movement towards improved efficiency and greater inclusivity in smallholder agriculture. ICT solutions can be used to communicate adherence to accepted quality standards, build trust and avoid free-rider problems, as market structures move from atomistic to out-grower and smallholder farmer association models. It is now also possible to move forward with simple solutions on the ubiquitous mobile phone and devise even more efficient solutions with the adoption of mobile 2.0 services with inexpensive smart phones and PDAs.
[For his full presentation please go to http://bit.ly/OogqL2]

Dr. Raj Saravanan talked about the e-Arik project in North east India. He presented the research findings of his peer-reviewed paper, which is included in the annexure. Briefly, he talked about the e-revolution ushered in via Twitter and Wikipedia. He talked about issues of food secu-

rity and the need to revitalise the agricultural extension system, saying that pilot ICT projects in agriculture have been floundering and need to be scaled up. In terms of innovation in the field of agriculture, he talked about the role of farmer-to-farmer communication, the provision of relevant and timely farmer-specific information, innovative partnerships and the use of various media that can lead to a rise in income for farmers, cost and time savings. For this, he said, the focus must be on farmers and their needs and not technological innovations. It was important to integrate value chain actors for comprehensive ICT projects, which are not just single service projects, with a corresponding need to institutionalise ICT for farmers and not just focus on pilot projects. Duplication of information needs to be avoided and ICT can only be complementary but it cannot replace the existing infrastructure or practices as it is only a tool, he cautioned. END

[For his full presentation, please go to http://bit.ly/MncKbO]

WILL THE PILOTS EVER FLY?
SCALING UP AND COMMERCIALISING OF ICT − AGRICULTURAL MODELS

CHAIR

SPEAKERS

Mr. VIKAS NATH
ASSOCIATE DIRECTOR, FUTURE OF THE UNITED NATIONS PROJECT, SWITZERLAND

DR. M MONI
DEPUTY DIRECTOR-GENERAL, NATIONAL INFORMATICS CENTRE, GOVERNMENT OF INDIA

MR. SRINIVAS GARUDACHAR
DIRECTOR, GRAMEEN INTEL SOCIAL BUSINESS LTD

SUMMARY OF THE DISCUSSION

Mr. Srinivas Garudachar talked about digital solutions for the world's social problems. He said that though there are innumerable pilots, several of which are apparently successful and may have shown some social impact and a trend towards sustainability, there is a need to find out how these can be scaled up or replicated. There is also a need to determine both the enablers and road-blocks for doing the same and how these can be overcome. He identified some of the challenges for scaling up these projects, saying that there were significant impediments that needed to be sorted out for the benefits to reach macro-socio-economic proportions. These include active involvement of agro ecosystem players, new business models like franchising, or those that are employee-run, as opposed to being entrepreneur-run. There is need for greater functional literacy, especially in IT and basic business literacy at the grass roots, with community mobilisation and active participation being crucial to the long-term sustainability of any such bottom-up initiative. Also, technological bottlenecks such as the availability of rural connectivity and power shortages need to be addressed, as well as greater systemic empowerment related to funding.

Some of the other problems he identified include the fact that agriculture stakeholders operate in a disconnected mode, where the farmer population is large, fragmented, illiterate, poor & bereft of choice. There is non-transparency in the entire value chain, right up to last mile imbalances. Thus, there is a need to empower the powerless for breaking the stranglehold of the powerful, which is where ICT applications can help bridge gaps, usher in transparency, cost effectiveness and enable a robust value chain, with a value-for-value exchange to ensure that all stakeholders are involved and engaged to deliver and benefit.

He talked about what Grameen Intel is doing in the field of agriculture and said that, via ICT, it is bringing the entire agriculture ecosystem's players-along with their inputs and modular offerings-together to the farmer's village. This is being done through a single window, in a convenient, cost-effective and transparent manner so as to improve productivity, mitigate risks and enrich the farmer. Improved livelihood results in spurring achievement of other unfulfilled basic aspirations like food, education, health, water, energy, clothing and transport and spurs socio-economic growth, creating entrepreneurial activity and local job opportunities.

The qualitative impact of these interventions are improved quality of life, localised decision making, self reliance, dignity, increased pride, local community empowerment & greater levels of participation. This he called the

MR. P.R. GANAPATHY
SENIOR ADVISER –
INCUBATION, VILLGRO,
INDIA

"Rural Inclusion" of the "First mile", where the bottom of the pyramid (BoP) farmer is becoming a key contributing stakeholder in society-at-large. He said that such change has the potential of doing away with the subsidy regime. In conclusion, he said that though ICT is a great enabler, and scaling up is surely possible, it takes far more than just ICT and there has to be a collective will to tackle & enable grassroots transformation.

[For his full presentation, please go to http://bit.ly/NMeqx6]

Mr. **P.R. Ganapathy** made a presentation on 'Scaling technology in agriculture: A few case studies'. He talked about Skymet in Delhi, which does meteorological data collection, analysis and dissemination, making the process user-friendly, timely, localised, delivered through a simple mobile phone, actionable and economic. Skymet has partnered with data distributors, FMCG, commodity traders, insurance, telecom and media firms and has shown visible results. For example, it has helped save crops for one subscriber worth Rs. 4.5 lakh while an SMS alert to another regarding a thunderstorm on an apparently clear day at sea helped save boats, nets and, most importantly, prevented the loss of life.

Another example he mentioned was that of Uniphore, which provides vernacular voice and mobile solutions and biometrics – for rural banking correspondents, for example – and voice recognition in eleven Indian languages. Uniphore's vernacular speech recognition is also used by Skymet, and it has mobile applications for different mobile platforms. It can be used for

There is need for greater functional literacy, especially in IT and basic business literacy at the grass roots, with community mobilisation and active participation being crucial to the long-term sustainability of any bottom-up initiative

contract farming, for information dissemination and both for outbound messages and for answers to inbound queries, facilitating rural banking and savings as well as enabling a mobile workforce. Crop advisories and access to market information and availability of sale receipts have saved both time and money for various farmers who are using this, while avoiding frequent and wasted trips to the market.

Identifying the challenges in scaling up these initiatives, he said there was a dearth of the right talent and the need to deliver real value in a sustainable business model. *[For his full presentation, please go to http://bit.ly/N7NMvI]*

Dr. **M. Moni** talked about mainstreaming ICT for improving agricultural productivity and providing for sustainable rural livelihoods. For this, he said, the key was enhanced productivity and better risk management, which can help increase the income of farmers. He lamented the fact that "in a country with more than 500 TV channels, there is none focussed on agriculture." He said that models based on better database and remote sensing technologies and GIS are necessary. What is also required is a rural informatics policy to know where and how IT can be applied for the maximum benefits. END

IS THE FUTURE MOBILE?

NEXTGEN FARMING: FUTURE OF TECHNOLOGY IN AGRICULTURE

SUMMARY OF THE DISCUSSION

Mr. **Olaf Hammelburg** made a presentation on 'Linking farmers to consumers and vice versa'. He talked about five coffee cooperatives in Latin America and Africa that comprise of over 140,000 farmers, where farmers are directly selling to consumers. He said that not only was brand ownership important to the farmer,

such a direct selling model cut out the middlemen and got the farmers better price for their produce, where customers are also able to choose their preferred coffee directly. He shared the model of the website with the audience where it is possible for consumers to see exactly where their coffee is coming from, via a source locator that has details of the farmer, where he's located, the size of his or her holdings and the varieties of coffee that he or she grows. He also said that all donations made through traceablecoffee.org go directly into

the pocket of the farmer. *[For his full presentation, please go to http://bit.ly/LRQp9A]*

Mr. Jawahar Kanjilal made a presentation on Nokia Life's agricultural services, which are currently live in India, China, Indonesia and Nigeria. These services are available in 17 local languages and are supported by over 75 knowledge referenceable; and provide access to experts. He said that today the Indian farmer is constrained with age-old techniques, lack of access to market information and is dependent on middlemen to sell his produce. Nokia Life, he said, helps by providing easy access to information that is relevant and hyper-local, while also providing

CHAIR

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JOINT SECRETARY,
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SPEAKERS

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PACHAMAMA COFFEE
COOPERATIVE (LATIN
AMERICA), CONNECTING
WORLDS, NETHERLANDS

MR. JAWAHAR
KANJILAL
GLOBAL HEAD,
NOKIA LIFE TOOLS,
SINGAPORE

partners, benefitting over 50 million people. They work on SMS and do not need high-priced GPRS or 3G phones to access. For agriculture, they provide news and tips, market prices and weather conditions. He shared some of the consumer insights on agricultural information via mobiles, which include timely & actionable information from trusted sources; are locally relevant as they are in the local language; are storable and an innovative user experience, thereby bringing timely information on low-cost mobiles to farmers in emerging markets.

[For his full presentation, please go to http://bit.ly/ P5VxT6]

Ms. Deepa Bachu made a presentation on 'Mobile Outreach: Can it create wealth and opportunities for farmers?' She talked about how Intuit India observes and understands

Indian small businesses and consumers to better develop offerings that work for them by building relationships with trusted leaders in India to ensure learnings from the very best in the sector, while helping to create jobs and an engaged workforce. According to a report released in 2011 by Telecom Regulatory Authority of India (TRAI), India has 538.38 million urban subscribers while 267.74 million rural subscribers. The mobile growth in rural areas is higher at 3.07 percent as compared to urban, which was about 2.06 percent. The share of urban subscribers has declined to 66.79 percent from 67 percent where as share of rural subscribers has increased from 33 percent to 33.21 percent.
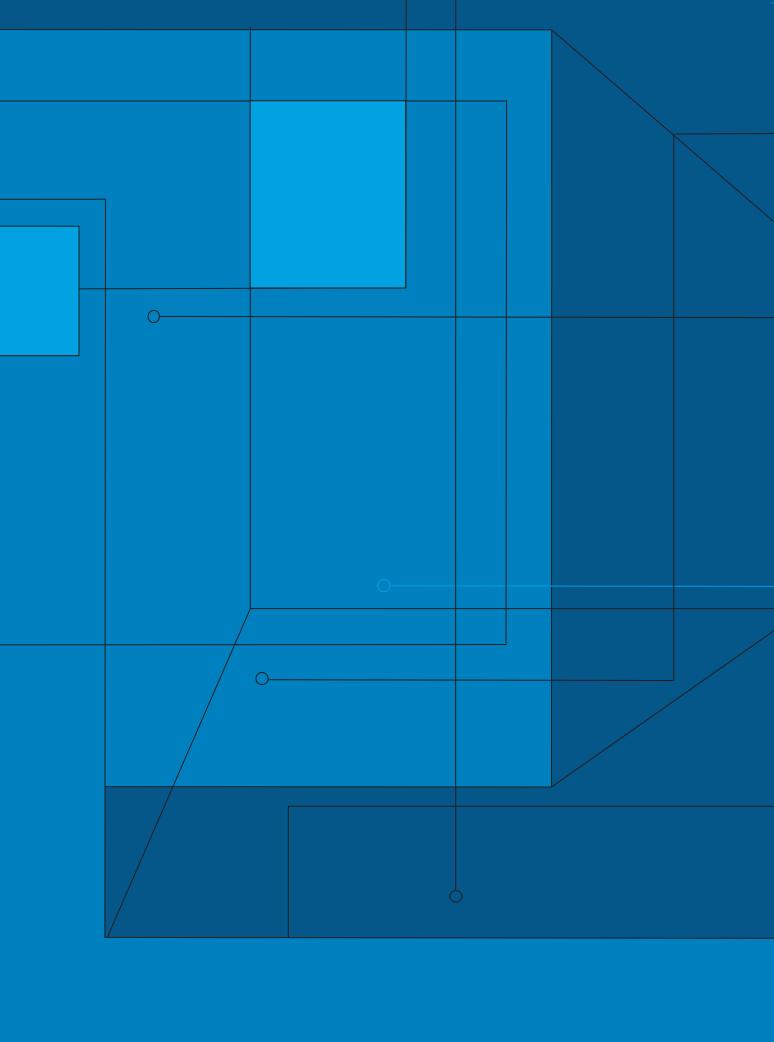
Fasal by Intuit is a revolutionary SMS service that is helping farmers in India improve their financial lives by providing an easy market connect to over 800,000 farmers every day, on their mobile phones for free. It offers real-time and reliable market price information delivered straight to farmers via SMS and is a free, highly-personalised service that allows buyers to communicate their demand & price at key points throughout the day so they can make informed business decisions. It matches sellers to buyers, increases buyers' access to sellers and their ability to plan inventory. Beyond price data, it also provides key services, including weather advisory information, information on education, marketing advertisements and offers.

Farmers can use Fasal to take important decisions regarding their harvest, which, she said, is resulting in an average farmer making 15-20 percent more money on his produce. It is a mobile service that lays the foundation for a data-rich communication platform to rural India. END

[For her full presentation, please go to http://bit.ly/ LRQXMx]

MS. DEEPA BACHU
DIRECTOR, EMERGING MARKET INNOVATION, INTUIT, INDIA

Education

CONTENTS

EDUCATION

The education sector is crucial for developing the human capital of countries, to innovate and find 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 vibrant 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 eliminate global poverty, hunger and inequality by 2015. Education receives special attention in MDG-2, which focuses 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 provide 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 from distant areas to access learning materials and instructors in a seamless way. Thus, technology truly allows for expansion of opportunity and access, while helping bridge the skills gap. Also, ICT contributes to a more conducive environment through the application of newer technologies 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 some of these challenges.

■ 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 absence

■ Usage of 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 "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 legacy 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 you 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 means increased access and flexibility, as well as offer 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 fundamental right of all to education, is to be realised. Age barriers, as well as distances, can be transcended, helping bring larger populations under 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.

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 increasing 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 its dynamic changes, allows for a qualitative difference, thus making it e-Content.

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 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 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 suggest 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 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 to help bridge the gap between the low ICT-skills among pupils (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 administers 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 part of the Symbiosis group and 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 centralized 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 have 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 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 also 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 socie-

ties 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 significant investment of time 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 classroom 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 do ICT-based interventions have on the 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 including new learning modules and best practices for multiple gains.

For this, there is a continuous search for value-based content across societies and institutions. Content structure, value and applicability are vital to effectively handle e-learning solutions and modules and for their use across societies. *Can innovative and sustainable digitisation of content enhance classroom learning? How can ICT help?*

Many workers have been dislocated, while 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 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 policymakers, via robust idea exchange. How can we convert small successes into dependable guidelines that can be suitably adapted by countries as per their unique challenges? How do we address the challenge of emulating successes while adapting to change? END

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VOCATIONAL TRAINING AND SKILL UPGRADATION

SUMMARY OF THE DISCUSSION

Mr. Dilip Chenoy informed the audience that there is a current skill gap of 347 million people in 22 sectors among the working population of India. 47.8 percent of India's population is less than 29 years of age and that this will increase to 49 percent by 2021. Despite a large working population, workers are not adequately skilled to meet industry requirements, either because of a high drop-out rate, low enrollment rates in vocational training centres and/or due to low in-service training levels in the country. He identified ten key learning gaps: the lack of skills in the existing workforce; unfavourable global comparisons; the varying status of training across Indian states; the way the problem is only growing every year. He said that the fact that other economies are doing far better; employability still remains a question mark in India. Levels of in-service training in India are low; the issue is more acute out-

MR. LOKESH MEHRA
DIRECTOR, EDUCATION
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INDIA

ently also the most suitable and least problematic. Globalisation has created a new world order where economic prosperity depends more on brains rather than brawn. It is a world where people use their brains instead of their hands.

The new economy has brought with it an IT revolution which shows three marked trends – the omnipresence of microchips; plummeting data costs; and reduced computing costs. Research shows that information that is both heard and seen is retained for a longer time and, thus, ICT can help in imparting education using more audio-visual tools.

The key to effective learning is motivation. Technology can be applied as a more individualistic approach to motivate a person to learn, he said. Entertainment leads to inspiration, which in turns leads to motivation to study and aspire to become something. It is here that ICT can play a very important role in integrating entertainment and education.

[For his full presentation, please visit http://bit.ly/MXluFK]

Mr. Lokesh Mehra talked about skilling the masses for sustainable inclusive growth. Out of 700 million people in India (which makes up the working population of the country), only about 200 million graduate while the other 500 million drop out and remain unskilled and, hence, remain unemployed. Microsoft, he shared, has trained 18,000 Indian Army personnel under Project Kshamta, both in IT and English skills.

Some of the challenges he outlined included the fact that in the 15-29 age group, only 3 percent received formal vocational training, while only 8 percent got any informal vocational training. He talked about the gender & rural/urban divides, as well as the lack of opportunities for continuous skill upgradation and the resultant lack of vertical mobility. He said there was an absence of linkages with changing market needs, exacerbated by poor infrastructure, minimally-qualified staff, obsolete skill trades and

side the companies. Skills shortages in the next ten years are estimated to be around 93.6 + million; and current capacity can not meet future demand. The private sector faces several challenges in the process of skill development. These include reaching out to very large numbers in dispersed areas, providing quality teachers with small batch sizes, and making it all cost effective to meet the teacher's salaries etc.

The National Skill Development Corporation (NSDC) is a PPP with a target of skilling 150 million people by 2022. ICT can help and is required in different stages of the skill value chain i.e. for mobilising people to upgrade their skills, build aptitude, training, assessment, placement etc. "It will help build the trust been the employer and employees, said Mr. Chenoy."

[For his full presentation, please visit http://bit.ly/NFOuTe]

Prof. K.K. Aggarwal said that ICT for vocational education is a reasonably good solution, and is pres-

the low priority accorded to vocational training. The government has also not provided adequate incentives for private players to enter the field of vocational education. He talked about http://dsaksharta.in (Digital Literacy), which is a website where a lot of basic computer and IT skills can be learnt online. "Skills will become the new global currency now, he said."

[For his full presentation, please visit http://bit.ly/MVgbQi]

Mr. Rajat Khawas spoke about how technology in education and vocational training can help achieve consistency in teaching and learning; increase ways to ascertain the validity of a candidate's identity and how it results in increasing scalability by reducing costs, while maintaining consistency and authenticity.

He said that what was required for the effective use of learning technology was to have more teachers and trainers who are fully trained in appropriate quality assurance and assessment processes and in the use of technology support tools. Also needed is fully-tracked learning, from the diagnostic stage to completion, as well as qualification and learning content embedded in trainer, assessor, learner and employer/manager workflows (e-portfolio). Content that is delivered must also be customised and be made more up-to-date. This can lead to greater consistency in the approach to teaching, while improving the quality of the overall learning experience. It helps improve the validity of a candidate's identity, reduces costs, increases the ability to scale up and leads to improved efficiency with higher quality learning outcomes and direct employer business benefits. It can also help in the faster completion of vocational programmes and lead to more

> **The new economy has ushered in an IT revolution that shows three marked trends – the omnipresence of microchips; plummeting data costs; and reduced computing costs. ICT can help in imparting education, using more audio-visual tools.**

efficient use of classroom time. Would you invite a plumber in your house who has only studied online, he asked? Vocational qualifications can be consistently monitored, delivered and quality assured anytime and anywhere through online learning platforms like Learning Assistant. Tests can be set up anytime and anywhere, performance feedback can be given within days. It would reduce paperwork and administration hassles and tests can be downloaded or delivered without the need for a permanent internet connection. Teacher training could also be made consistent using technology. E-volve is Manipal City and Guilds (MCG)'s new assessment platform that helps conduct secure online exam tests and evaluations, he said.

[To view his full presentation, please go to http://bit.ly/NO2AQr]

COMMENTS FROM THE FLOOR

Replying to one of the questions from the floor – whether ICT in vocational training is advantageous for those who need access to it most – the panelists said that this is exactly why ICT is a significant tool for remote areas where formal institutions or knowledge centres cannot be built. It can reach students and teachers to create a certified infrastructure of learning and teaching, at low costs and by covering large numbers. Addressing the issue of shortage of power, it was felt that all kinds of media could be used to impart education, especially mobile phones, radio etc. and that solar power was likely to play a crucial role in the future to help provide electricity for greater access. END

E-CONTENT – INNOVATIVE AND SUSTAINABLE DIGITISATION OF CONTENT TO ENHANCE CLASSROOM LEARNING

CHAIR

PROF. ALAIN SENTENI
DEAN, SCHOOL OF
E-EDUCATION, HAMADAN
BIN MOHAMMED
E-UNIVERSITY, UAE

SPEAKERS

DR. DIMITY DORNAN
MANAGING DIRECTOR &
FOUNDER, HEAR AND SAY,
AUSTRALIA

DR. PAUL T. NLEYA
ASSOCIATE PROFESSOR,
DEPARTMENT OF
EDUCATIONAL TECHNOLOGY,
THE UNIVERSITY OF
BOTSWANA, BOTSWANA

SUMMARY OF THE DISCUSSION

Prof. Alain Senteni talked about border-less e-content, which integrates traditional curriculum with user-generated content (for instance, wiki). Instead of passive recipients of the teacher's knowledge, students become proactive knowledge builders, leading to not just a top-down transmission of knowledge but bottom-up participation. He said that content, technology and pedagogy should be integrated.

What's required is e-content that would help passive learners to become proactive knowledge builders, and e-content that can be recycled, instead of re-inventing the wheel all the time and combining traditional perspectives with socio-constructivist ones.
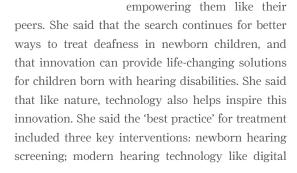
Learning objects and reusable collection of content used to present and support a single learning objective, help in the reuse of educational content online. In the Hamadan bin Mohammad e-University, where Prof. Senteni teaches, learning objects are the main course material, not an additional support for self-study. He further talked about Equella, a software that can store digital textbooks; and Moodle, a software that has syllabi, timetable, assessments and reference material. Both are used to impart education. In response to a question regarding the great exuberance for automation in India, whether online e-content would mean lower quality with one teacher catering to the needs of too many students, Dr. Senteni said that the teacher-student ratio has to be ideally kept to 1:25 students, even if it is through online teaching.

Dr. Dimity Dornan talked about the power of technology for children with a disability. She asked the audience a simple question with her presentation: 'What if we could eradicate the impact of the most common disability in newborns globally?'

Hearing loss, she said, is the most common disability in newborn babies and, because of innovations in technology, it is now treatable so that these children can also listen, talk and read the same way as children with normal hearing. For years children with hearing disabilities were diagnosed late, which led to poor comprehension, unintelligible speech, poor reading skills and problems in continuing their education-leading to limited career opportunities and poverty. Today it is possible for these children to converse with others on an equal footing, read, learn and grow normally, allowing them to gain optimal education and be able to choose from multiple life pathways, empowering them like their peers. She said that the search continues for better ways to treat deafness in newborn children, and that innovation can provide life-changing solutions for children born with hearing disabilities. She said that like nature, technology also helps inspire this innovation. She said the 'best practice' for treatment included three key interventions: newborn hearing screening; modern hearing technology like digital

SPEAKER

DR. RITVA ENGESTROM
CENTRE FOR ACTIVITY THEORY & DEVELOPMENTAL RESEARCH, UNIVERSITY OF HELSINKI, FINLAND

hearing aids and cochlear implants; and new brain-based education - auditory-verbal therapy. But this is possible only if hearing screening is done earlier and effectively in newborns to diagnose the problem, and digital hearing aids or cochlear implants are provided without delay, along with therapy.

Hear and Say Foundation uses internet technology for diagnosis through tele-audiology, for treatment through telemedicine and for professional work and training to help children born with hearing disabilities to learn and study.

Dr. Paul T. Nleya talked about the historical development of the Botswana expansive school transformation project (BEST). He said that though technology matters, good teaching matters more. The teaching profession, therefore, needs to evolve quickly and strongly.

The Stellenbosch Declaration in July 2005 recommended that international networks of teachers be developed & activated, including in developing countries. This should be done along with empowerment of innovative teachers and promotion of communities of practice for innovation - in order to facilitate the dissemination of innovations. Under the Maitlamo ICT Policy, Botswana attempted to integrate all its ICT activities for the first time, starting with computers at the primary level to in-service training.

Dr. Ritva Engestrom worked with Dr. Nleya on the BEST Project and they made certain key observations during the implementation of this programme in Botswana, including that implementing ICT in schools was more complex than only adding technology to teaching practices. Also, in

> **What's required is e-content that would help passive learners to become proactive knowledge builders, and e-content that can be recycled, instead of re-inventing the wheel all the time and combining traditional perspectives with socio-constructivist ones.**

order to get results in the widespread use and impact of ICT, education projects should start coordinating the introduction of computers with national policies and programs related to changes in curriculum, pedagogy, assessment, and teacher training.

They also observed that there are no universal solutions when it comes to integrating ICT into the schooling system, after international tests for comparing national school systems revealed conflicting agendas of reforms for managing educational change.

The following are some of the contradictions that came into light when the BEST project was implemented –

1.   Teachers do not have time and are not professionally rewarded in using ICT. They believe that "if you can coax the students into getting good marks, even if they don't understand the content, you are a good teacher";

2.   There are notable constraints of creative use and to making use of available technology in pilot schools;

3.   "We have a government policy that does not allow the installation of software that is not in government machines, which poses a problem"; said Dr. Nleya.

4. Policymakers in Botswana are not adept at critically analysing concepts, because the concept has more political appeal than educational value. Nobody has an interest in paying attention to mutually-conflicting epistemologies and consequences or justifying actions of the concepts. END

OPEN LEARNING AND DISTANCE EDUCATION

CHAIR

MR. N.K. SINHA
ADDITIONAL SECRETARY,
MINISTRY OF HRD,
GOVERNMENT OF INDIA

SPEAKERS

DR. S.S. JENA
CHAIRMAN, NATIONAL
INSTITUTE OF OPEN
SCHOOLING (NIOS), INDIA

DR. SANTOSH PANDA
PROFESSOR OF DISTANCE
EDUCATION, STRIDE, INDIRA
GANDHI NATIONAL OPEN
UNIVERSITY (IGNOU), INDIA

SUMMARY OF THE DISCUSSION

Mr. NK Sinha talked about the National Mission on Education through ICT (NMEICT), saying that the "absence of teachers and peer pressure is a problem in distance education. But then motivation to learn can be ignited among students." He informed the audience that the government plans to have 1,000 DTH channels dedicated to education, of which 50 will be available in the next two months. E-content for education is already available on the National Programme on Technology Enhanced Learning (NPTEL) website (http://nptel.iitm.ac.in) with virtual laboratories and videos lectures of professors from the old IITs- from where students can learn sitting in their homes, anytime they want. More than 440 universities have been connected with 1 GB optic fibre net which is connected to the National Knowledge Network (NKN). More than 18,000 have got broadband connectivity. A student of any college or university can access the e-resources available online at nlist@inflibnet.ac.in.

Mr. Krishan Khanna talked about Dynamind, an e-teacher and e-trainer and Interactive distance education through artificial intelligence and cloud. The degree of learning is directly proportional to the level of engagement of the learner, he said. He shared with the audience that according to educational psychologist Benjamin Bloom's 2 Sigma Problem, a 50 percentile student will score above 98 percentile if given one-to-one tutoring.

The learning cycle has four steps - exposure to the learning material, measurement of learning, feedback to the learner and then remedial measures for the learner. The shorter this cycle is, the better the learning is, he said. Also, the attention span of an average person is 15-20 minutes so the mode of learning has to be interactive and Dynamind ensures that. It provides a great platform for one-to-one tutoring with a short learning cycle, as feedback is immediate and continuous to the learner. A typical Dynamind virtual classroom has one teacher for every learner, facilitating both passive and active learning along with one-to-one mentoring.

It can be used for schools, colleges, vocational training, corporate training or life-long learning for adults. It uses the internet as the library, is easily scalable as it is low cost and provides a highly customised and personlised learning experience to the individual, based on the fact that every person is different. The first offering of the platform, he said, is basic concepts in physics, chemistry, math for Class 11 and 12 (at a cost of Rs 15,000 per year, per student); common entrance exams like IITJEE and AIEEE preparations (Rs 25,000 per year, per student), etc.

[For his full presentation, please go to http://bit.ly/KOm2Ag]

MR. KRISHAN KHANNA
CHAIRMAN, i2K
SOLUTIONS, INDIA

Dr. SS Jena talked about open schooling for vulnerable youth. The benefits of open education are that instead of being teacher centric, it is learner centric; allows life-long learning; flexible entry and exit into the system; flexibility in the choice of subjects; and exam schedules while being cost-effective. Education must empower the learners and make them employable. He noted that there has been a paradigm shift from the traditional constraints on education, which has made it possible for people to seek 'self-paced' open learning opportunities. There is also a change in approach from "You Learn what we offer" to "We offer what you want to learn".

It is education 'anytime, anywhere, and for anybody' who wants to learn. The target group, though, are learners above the age of 14 who are children out of school, girls and women, children from socially backward communities, rural youth and urban poor, unemployed or partly employed, and differently-abled students. He said that the hallmark of open schooling is flexibility, in terms of the selection of subjects and courses; the place of study, which lacks geographical barriers; the length of study, with a minimum of one to a maximum of five years; selection of the mode of study, with the freedom to use the technological option; flexi-options for exam schedules and the means with which to take them. Another hallmark is freedom, with regard to opting for subjects based on needs, interest and abilities; the selection of subjects of academic interest along with vocational ones; the freedom of credit accumulation and transfer; as well as the freedom of re-admission.

> **The learning cycle usually has four steps – exposure to the learning material, measurement of learning, feedback to the learner and then remedial measures for the learner. Keeping this cycle short can ensure better learning.**

Self learning materials used include broadcasting of lessons, counseling and live interaction, teleconferencing, online interaction, web-based learning resources, videoconferencing and multi-point interactivity. ICT facilitates this through radio, television, mobile technology, computers, personal tablets, internet connectivity and satellite interaction. The National Institute of Open Schooling is constantly striving to emerge as a National Resource Centre in Open Schooling that aims to change the lives of individuals and society at large, by providing and facilitating easier and better access to distance learning and open education, where curriculum planning and development is based on the identified needs of various groups.

Courses for primary, secondary, vocational and life-long learning are available and various media are used to impart education at NIOS including printed material, contact classes, lab practicals, internet, teleconferencing, telecast, audio-video cassettes, radio and web radio broadcast. So ICT in terms of mobile technology, radio, phone and internet are being used.
[For his full presentation, please go to http://bit.ly/MrWrOC]

Dr. Santosh Panda made a presentation on 'ICT, Open and Distance Learning and Higher/Further Education'. He identified access and equity; curriculum reforms and the need for innovations; the relevant use of ICT and its attendant costs; the relevance of quality vocational education and national and regional training as some of

the major concerns in higher education. He traced the journey of distance education in India from text-book heavy correspondence education, to multi-mass media education, right up to conference-based tele-learning to the stage of intelligent flexible learning, which now involves automated business processes and multiple media outputs from a single source.

He walked the audience through initiatives like the National Mission for Education through ICT (NMEICT) and its 'Sakshat' online portal that is a national learning resource repository and interactive learning platform; the National Programme on Technology-Enhanced Learning (NPTEL); the Technology-Enhanced Open Learning System called 'Vedyadhara', launched by the Indira Gandhi National Open University (IGNOU), and the School of Education Technology of Jadhavpur University. He talked about the need for blending strategy using Web 2.0 tools on an informal network, open education resources and formal e-courses with the occasional physical presence and meetings.

He said that in India there was a confused interpretation of distance education and that there is an urgent need for a national policy on distance education in India; a national framework for distance education both for in-country and cross-border offerings as well as norms for ISO certification for distance/open/flexible/online/blended learning.

The IGNOU STRIDE Diploma in E-Learning, which Dr. Panda heads, involves the following elements: self-study of open education resources on the Web with copyright clearance; online activ-
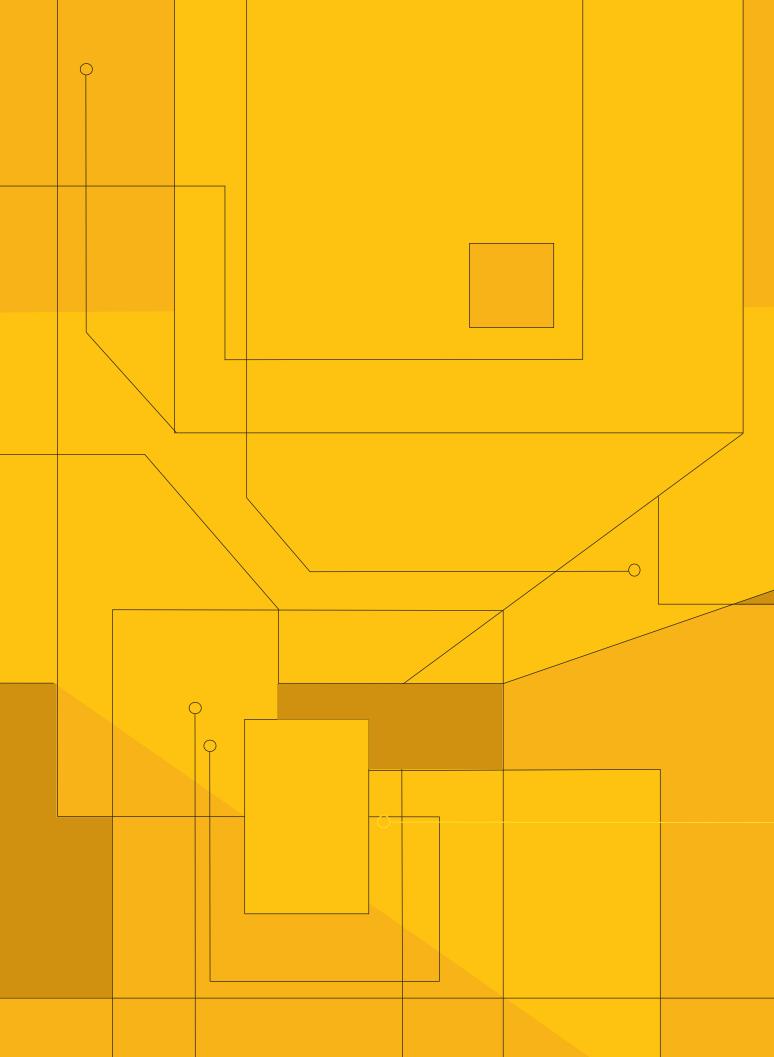
The benefits of open education are that it is learner-centric, allows for life-long learning, provides flexible entry and exit into the system and offers flexibility in the choice of subjects and exam schedules, while being cost-effective.

ities and collaborative discussion forums, assignments on Moodle Learning Management System; interaction through specially-created Google Groups. It also includes weekly/fortnightly teaching and lectures; virtual classes through Adobe Connect; compulsory face-to-face and hands-on learning for a week for media, technology, software, open resources/open technologies design, culminating in an exam through projects, e-portfolios, and presentations online to external examiners.

He went on to identify some managerial and pedagogical issues that need to be addressed. Managerial issues include the need for an institutional ICT policy and preparedness; access and equity in distance education and open learning; networking, collaboration and interaction; capacity building of functionaries; ensuring cost-effectiveness and cost-efficiency with regard to both institutional and private costs; managing teachers' workloads and issues of copyright, plagiarism and intellectual property rights. Pedagogic issues he mentioned include the need for interactive digital content (print, audio, video, graphics, animation, database); instructional design (technology, content and learning styles); a versatile user interface; a good online resource repository; OER and cloud learning; self-learning space and asynchronous collaborative learning along with ICT and vocational education, skill development and ICT for learners with special needs. END

[For his full two-part presentation, please see http://bit.ly/OCp6lx and http://bit.ly/SQi5Mo]

E-Governance

CONTENTS

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, 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 technologies can drive the larger political agenda of inclusive growth and 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 the most 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 government 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 delivery 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 need to change the mind-set of all the stakeholders involved, i.e. politicians, government officials 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 integral 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 interweave the principles of e-governance 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 reconstituting 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 presuppose 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 in the 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, the technological architecture on which such applications rest need to be made not only secure, but also 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 are objectives, on their own merit

and in conjunction with each other, justify the continuance 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. It has been well said that 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) – the 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 lifecycle approach i.e. providing public services to citizens which would be 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 processes, 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 an overall environment of a more accountable government machinery. This, in turn, would result in enhanced productivity and efficiency 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 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 health care 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 simple – verify the ages of their customers for eligibility of services. Governments can also use e-IDs to streamline public services, allow individuals to sign and submit forms online, and further offer innovative services

■ While ICT leads to transformation in work processes, it also lowers transaction costs by enabling transparency and accountability, both for government and suppliers

■ 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 rollout of some services such as, e-filing of income tax, the government can increase its revenue collections.

Still, considering the larger perspective 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 and 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 such as, Income Tax, Customs and Excise and Passports at the central level and Land Records, Agriculture and e-District at the state level. There are also a number of integrated MMPs such as e-Procurement and Service Delivery Gateway 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 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, a farmer 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 other parts of the country.

In the next phase of BHOOMI, the 'LAND RECORDS ON WEB' is 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; 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 land records, 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 Andhra Pradesh, 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 has 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.

Belgium- e ID

Belgium has worked diligently to provide 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 report 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

model was a mobile-based money transfer service launched in Africa in a partnership between Voda-

fone 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 countries 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 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.

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 form 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, RSBY card number, BPL card number, UID

■ 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 Are 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 in 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 e-Procurement 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, some with high levels of corruption, *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 unauthorized 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 with governments, organizational resistance change management, resistance to change are some challenges which need to be addressed, when looking at issues of building capacity. *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. █

CHAIR

SPEAKERS ↘

Mr. LEON STROUS
PRESIDENT, INTERNATIONAL
FEDERATION FOR
INFORMATION PROCESSING
(IFIP), THE NETHERLANDS

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MR. SRIDHARAN SANKARAN
SENIOR DIRECTOR-
ENGINEERING, EMC

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↑

MR. AJAY SAWHNEY
PRESIDENT & CEO,
NATIONAL E-GOVERNANCE
DIVISION (NEGD),
DEPARTMENT OF
ELECTRONICS &
INFORMATION TECHNOLOGY,
GOVERNMENT OF INDIA
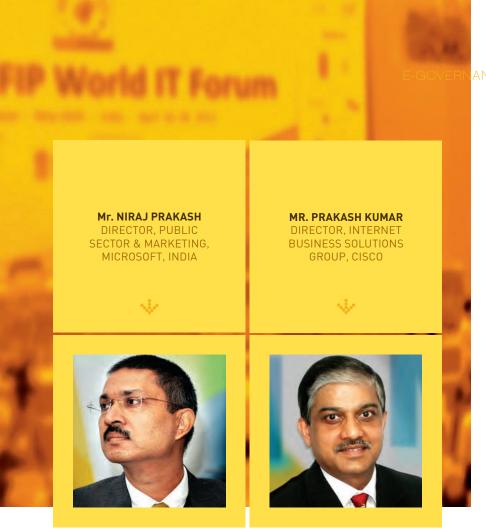
CAN TECHNOLOGY ADDRESS GOVERNANCE ISSUES?

SUMMARY OF THE DISCUSSION

Mr. **Ajay Sawhney** chaired the discussion on e-governance around the following questions: How do we get the government to be more responsive and accountable? How can we use technology to discipline the monopolistic nature of government and make it function to improve citizens' lives?

"Some of the big governance issues today include uneven access to facilities, benefits not reaching the masses and lack of transparency. These can be tackled by using technological tools available today - tools that can empower decision makers as well as citizens through the right data and measurement metrics," said **Mr. Prakash Kumar**, Director, Internet Business Solutions Group, Cisco India. He sought to explain government inaction and the phenomenon of graft through a simple formula of Corruption = (Monopoly + Discretion) – Accountability, saying that IT can tackle this through greater transparency, citizen engagement, removal of middlemen and capacity building. *[For his full presentation,*

Mr. NIRAJ PRAKASH
DIRECTOR, PUBLIC
SECTOR & MARKETING,
MICROSOFT, INDIA

MR. PRAKASH KUMAR
DIRECTOR, INTERNET
BUSINESS SOLUTIONS
GROUP, CISCO

please see http://bit.ly/LpNzEZ]

"Technology is a great enabler to solve various governance issues. When we talk about governance, what is of paramount importance is that governance is about designing programmes and services that are of value to the society. So, while we are proud of what we have achieved in governance through technology over the past thirty years, we are also humble that we could do only so much. Because there's still so much to be done in front of us," said **Mr. Sridharan Sankaran**, Senior Director – Engineering, EMC India. He reminded the audience of a famous quote from Bill Gates's book *The Road Ahead*: "We always over-estimate what's going to happen two years ahead of us; and we seem to under-estimate what will happen ten years down the line." "So if you look ahead another ten years and see a conference like this happening, we would all be amazed at the progress we would have made by then," he said.

According to **Mr. Niraj Prakash**, Director,

Public Sector and Marketing, Microsoft, India, "There are two pillars of technology on which governance really rests. One is technology modernisation itself and the other is process reforms. We have seen over the decades that technology does two things: one is the democratisation of information and the other is that it creates what we can call institutionalisation of memory." Because of technology, he said, we no longer have to depend on any single individual in the government for any important transaction. However, he emphasised that technology itself cannot give us good governance. Citing an example of how technology can help bring about change after process reform, he said that in the election process followed in India, voters can fill up a form and assert that they do not support any candidate – but the same facility is not available on the EVMs (electronic voting machines). "So while the process reform can come first and technology later or whether technology comes first and process reform later, the key thing is that the two have to match," he said. *[For his full presentation, please see http://bit.ly/KLQO88]*

Mr. Leon Strous, President, IFIP, reminded the audience that though technology can advance e-governance, it's all about the people who develop the technology, provide access and work on content...so the 'people' element is important and necessary to realise the benefits of e-governance. END

CHAIR

SPEAKERS

DR. EDGAR A. WHITLEY
READER IN INFORMATION
SYSTEMS, DEPARTMENT OF
MANAGEMENT, LONDON
SCHOOL OF ECONOMICS
AND POLITICAL SCIENCE, UK

DR. IVAR TALLO
MEMBER, EXECUTIVE
BOARD, E-GOVERNANCE
ACADEMY FOUNDATION,
ESTONIA

DR. Y.K. SHARMA
NATIONAL INFORMATICS
CENTRE, INDIA

E-AUTHENTICATION - ISSUES AND CHALLENGES:
STATE DATA BANKS AND ISSUES OF PRIVACY

MS. K. GANGA
UNIQUE IDENTIFICATION
AUTHORITY OF INDIA (UIDAI)

⌄

MR. SUDEEP DAS
LEAD SOLUTIONS
ARCHITECT, INDIA & SAARC,
RSA, THE SECURITY DIVISION
OF EMC

⌄

SUMMARY OF THE DISCUSSION

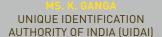Speaking on the session, **Dr Edgar A Whitley** said, "There are several key benefits of providing a legal identity to all citizens that cannot be overlooked, despite the challenges. These include the right to education, healthcare, voting, banking services and proper redress of disputes arising from property titles and inheritance, among others." He shared with the audience the case of the UK, where the current government recently discontin-

ued and dismantled the identity cards project. He said that the more we share information, the more important it is that people should be confident their data is safe and secure. He also noted that the objectives of inclusion and security can be mutually exclusive at times. According to him, there are three key things associated with an identity policy: one, it needs to be able to address the issues of exclusion; two, the primary focus should be on the needs of the citizen; and three, ample care should be taken because if implemented badly, there can be severe economic and political consequences.

[For his full presentation, please go to http://bit.ly/OQo6cn or visit http://www2.lse.ac.uk/researchAndExpertise/Experts/e.a.whitley@lse.ac.uk to see some of his publications]

Sudeep Das, Lead Solutions Architect, India & SAARC, RSA, The Security Division of EMC, spoke about the technology side of e-authentication. When we talk about the authentication of various ICT systems in governance, we should also think about what would be the objectives of an authentication framework. So, functionally, it should be simple to use by the users, and it should also give the confidence to the user that whatever information he or she is providing

through the system, it is secure and that it will not be misused or breached in any manner. From the provider's perspective, the information gathered through the authentication system should be able to be integrated with applications at the back end, he said.

According to **Dr. Ivar Tallo**, there is a misunderstanding among citizens of various countries about the national identity card schemes and privacy issues. "What the government can do is create a framework for data collection but it should be the users who should make choices about their privacy settings, thus designing their own exposure," he said. "It's also important to note that data privacy principles are determined by state-society relations." Even in the European Union, he noted, there are different opinions on privacy. "There are several directives or principles but the interpretation is different in different regions of the Union," he said. The problems of data privacy are now surfacing in a greater measure because of the movement of large chunks of data from one region to another, such as that in cloud computing. Also, almost all data today is digital but that is not so for laws and regulations.

[For his full presentation, please see http://bit.ly/ MLcLHK]

Speaking about the Government of India's Unique ID project- Aadhaar, **Ms. K. Ganga** from the UIDAI said, "So far, we have done 20 crore enrolments and also generated 17 crore Aadhaar numbers. In another two years we will do 40 crore more enrolments, taking the total to 600 million. The authentication we are talking about is one-of-its-kind in the world today, which is basically online authentication as against the traditional card-based or document-based authentication systems. What we are talking about is online authentication with a central data repository. To address the issues of privacy, we are capturing only very basic data about individuals – just name, date of birth, address and the spouse or guardian's name (in case they would like to share)." END

CAPACITY BUILDING - BUILDING INTERNAL CAPACITIES, WITH SPECIAL ATTENTION TO
PROJECT MANAGEMENT, ADMINISTRATIVE REFORM AND CYBER-SECURITY

CHAIR

MR. PADAMVIR SINGH
DIRECTOR, LAL BAHADUR SHASTRI NATIONAL ACADEMY OF ADMINISTRATION (LBSNAA), INDIA

SPEAKERS

DR. SAMANTHA LISCIO
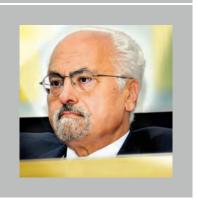CORPORATE CHIEF STRATEGIST, ONTARIO PUBLIC SERVICE, GOVERNMENT OF ONTARIO, CANADA

DR. NAGY HANNA
SENIOR FELLOW, CENTRE FOR POLICY ON EMERGING TECHNOLOGIES & SENIOR ADVISOR & LEAD STRATEGIST, WORLD BANK, USA

SUMMARY OF THE DISCUSSION

Speaking on the theme of capacity building for e-governance, **Mr. Padamvir Singh**, Director of Lal Bahadur Shastri National Academy of Administration (LBSNAA), India, said, "If you go to a central and state government office, chances are you'll still find the same old processes and paper files that were there decades ago." He said that one big challenge is that "the back end automation has not been able to keep pace." However, he said, things are now changing, especially with the help of organisations like NIC. "Thanks to NIC's help, we have been a paperless office for one full year without any glitches."

The e-Office at LB-SNAA, he said, is all about the creation of e-files and e-receipts under which there is complete migration to a paperless office, which is easy for all the staff to identify with and use for purposes of filing for leaves, touring, supplies and services, with feedback into work flow automation. The benefits, he said, included being able to work from anywhere on the campus, immediate movement of files, saved manpower, reports of pending files and receipts being generated with ease and an enhanced monitoring and control of file work. It has also led to better archiving and control of records and data, making all notices available on the dashboard, easy search and better inventory and record

keeping for a seamless work flow system.
[For his full presentation, please see http://bit.ly/LOr-BQA]

Dr. Samantha Liscio shared how her organisation in the Government of Ontario (the largest province by population, with about 15 million people), Canada has saved CAN$69 million since 2008 by transforming the IT department and how it worked to convert five aging data centres into a single centre. Referring to the need to build all three components in e-governance – infrastructure, device and content – she said, "In Ontario we have been working on addressing our infrastructure challenges. We are quite well-equipped in terms of devices but we have a problem in terms of content. But this problem is because we have too much information and historical processes. We have tended to use ICT to reinforce the existing processes but that's not always the best way to approach things and I think we have a lot to learn from countries like India that have a more problem-solving culture...the challenge of our government is to strategically invest in technology to better serve the citizens."

One of the key things in that role, she said, is that the decisions or investments made today do not limit the government's options in the future.

Dr. Nagy Hanna talked about the need to build the competencies of CIOs and e-leaders. "Today citizens and the Net generation have much higher expectations from the government, which

SPEAKER ◥

DR. RAJIV SHARMA
MISSION DIRECTOR, NATIONAL MISSION CLEAN GANGA (NMCG), NATIONAL GANGA RIVER BASIN AUTHORITY, MINISTRY OF ENVIRONMENT & FORESTS, GOVERNMENT OF INDIA

puts more demands on CIOs and e-leaders. So they need to be transformational leaders and understand business or sectoral issues rather than focus only on technical aspects." Leadership often requires collaboration among many leaders rather than just one or two "heroic" leaders, he said.

Dr. Rajiv Sharma said, "Many of the India government's processes are archaic and resistant to change. We often do something just to follow a process rather than focus on the outcome of that process." Talking about capacity building in government, he said, four things need to be kept in mind: first is the citizen focus, because it is for the citizens that all e-governance efforts are directed; second there should be focus on resources and finances; third, process focus is also important; and finally, there should be performance indicators in order to measure the output or results. END

MOBILE TECHNOLOGIES-WITH A FOCUS ON FINANCIAL INCLUSION

CHAIR

DR. RAJENDRA KUMAR
DIRECTOR PROJECTS,
DEPARTMENT OF
ELECTRONICS & IT,
GOVERNMENT OF INDIA

SPEAKERS

MR. BONG-SOO KEUM
EXECUTIVE DIRECTOR,
NATIONAL INFORMATION
SOCIETY AGENCY (NIA),
REPUBLIC OF KOREA

MR. SRIRAM JAGANNATHAN
CEO, MCOMMERCE,
BHARTI AIRTEL,
INDIA

SUMMARY OF THE DISCUSSION

Mr. Bong-soo Keum spoke about the growth of mobile data and services in the Republic of Korea. He began his address by giving an overview of the mobile environment, followed by the status of the mobile financial market in Korea and the world. He also shared a few case studies. He said the focus of e-governance is now shifting gradually from the personal computer to mobile devices. This is because mobile devices are becoming increasingly popular with users than any other devices. Citing statistics from a Cisco Systems study, he said that mobile traffic growth is explosive. "Most large cellular operators now have the capacity to serve any user who wants to take up mobile services," he said.

Sharing the usage statistics of Korean users, Mr. Keum said, "In Korea, over 80 percent of households subscribe to broadband internet and as many as 98 percent of all citizens have a mobile phone. Even though the iPhone was introduced quite late in Korea, there are millions of iPhone users today. Overall, there are more than 20 million smartphone users in Korea." No wonder that the growth of mobile traffic in just a year was 11 times, he noted. "On the United Nations' E-Gov Development Index that took into account various parameters of e-governance in 193 countries, Korea stood first in the Service category and was rated No. 7 in infrastructure," he said. He noted that global financial transactions through mobiles will reach about $1 trillion in 2015 and mobile services are set for rapid growth in all parts of the world.

[For his full presentation, please see http://bit.ly/LvvQu3]

Mr. Sriram Jagannathan talked about 'financial convenience' through the use of mobile phones, saying that given the low penetration of financial products in a country like India, mobile phones can provide a readily-accessible, widely-available and viable 'container' of digital money, increasing its utility in providing financial inclusion. With only about 450, 000 point-of-sale machines, in a population of over 1.2 billion, the issuance and acceptance of plastic forms of money is limited. The use of mobile phones as tools of financial inclusion stems from the fact that a majority of citizens require a credible institutional source to save or borrow money. Thus, there is a need to create a digital payment infrastructure, but one that can accommodate the constraints of time and finances. In India, where there are over 900 million mobile phone connections; the mobile can provide a solution.

What also needs to change, he said, is the perception that in developing countries most people are not viable banking customers, offering the example of a smaller country, but one with similar demographics – Kenya – and its successful m-Pesa model. In this regard, a participant pointed out that Kenya's m-Pesa model, which had been mentioned by the panel, was a heavily subsidised one where the British government, via DFID, aided its genesis, which was set up without a regulatory framework, and regulations for which were only introduced later, saying this was an important characteristic to keep in mind when talking about its replicability.

Mr. Jagannathan said there was a need to change our thinking to make it more inclusive, and to leverage the roles played by banks, telecom companies, public utilities, community and microfinance organisations alike. Mobile payments, he said, carry the potential for transformation – like mobile phones did – and will only enrich the existing infrastructure, not disrupt or replace it.

In reply to a question from the floor, Mr. Jagannathan said that there are over 120 pilot projects on mobile-based financial inclusion that are running globally and that to make any of them replicable and

scalable it is important to leverage existing institutions and infrastructure to ensure that financial inclusion is made viable and sustainable, both for those providing services and those who benefit from it. He stressed the need for collaboration. And, in response to another point raised, he said that to link biometrics to authentication is trying to use a hammer to kill a fly, thus there is a need to keep it simple.

Dr. Rajendra Kumar's presentation focused on mobile technologies and their role in financial inclusion in a country like India, and he talked about the policy framework and key drivers for mobile-based financial inclusion. ICT, especially mobile technologies, he said, were critical for facilitating financial inclusion, by drastically reducing costs, making low-value transactions viable, enabling real-time transactions, dramatically increasing access points, bridging the last-mile gap and displacing cash. They can also be used not only to authenticate, increase transparency, address information asymmetries and lower demand-side barriers but also raise security and privacy concerns. He said that four broad areas could be identified in terms of policy: the business correspondent model; identification or KYC norms; consumer protection and mobile banking; mentioning recent Reserve Bank of India actions in light of these. Though he said that the model has been bank-led so far, with the exception of the mobile wallet by some TSPs, he also talked about the positive trend that is visible in the exponential growth of mobile penetration in India, making the mobile an exciting tool for financial inclusion.
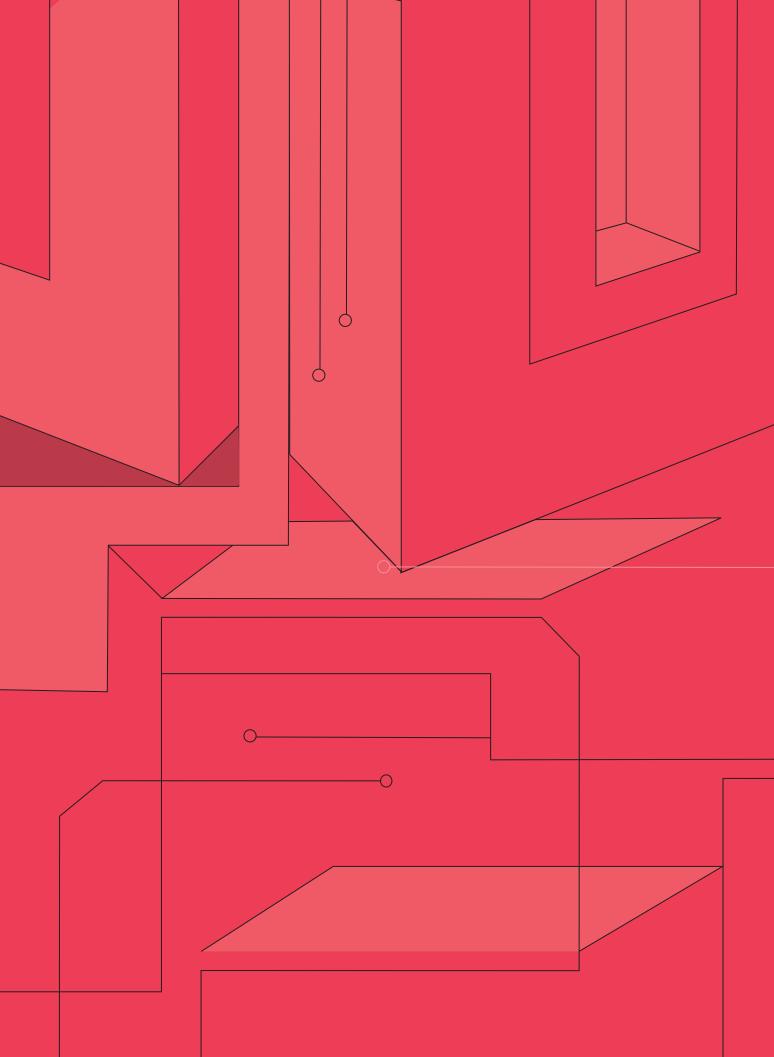
He said the Government of India had taken a variety of steps to develop the mobile governance framework, including making websites of all govern-

> **Given the low penetration of financial products in a country like India, mobile phones can provide a readily accessible, widely available and viable 'container' of digital money, increasing its utility in providing financial inclusion.**

ment departments and agencies mobile compliant; adoption of open standards for mobile applications; uniform short codes for mobile governance; and encouraging all government departments to deploy mobile applications for providing their public services. A Mobile Service Delivery Gateway is being developed by C-DAC, but at present, there is no common mechanism for e-authentication across all departments, which, once done, should help in building trust in online transactions; encourage transparency and eliminate paperwork and offline verification. He identified some of the major issues and challenges as those of localisation, like providing services in local languages; interoperability of transactions; authentication and security, which may be helped by the UID and e-Pramaan (authentication) framework. He talked about the different varieties of mobile devices and platforms and the need for open standard architecture; the lack of demand drivers and standards for mobile applications, as well as a multiplicity of telecom service providers, which might hinder the provision seamless services to users; problems of scalability on the mobile platform in a country like India; the limitations of available handsets and technologies; regional disparities in mobile penetration and the lack of user education and awareness.

In response to a question from the floor, Dr. Kumar stressed the need for interoperability and integration with the core banking solutions of all banks, for the provision of seamless transactions that can facilitate financial inclusion. END

[For his full presentation, please see http://bit.ly/ LYP3XW]

Health

CONTENTS

HEALTH

Health has an impact not just on the well-being of a person, but also on his or her socioeconomic state. 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 the 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 ICT.

e-health 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. It can enable a wide range of population-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 lead to the creation of new, high-tech markets and jobs.

ADDRESSING THE 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 this age of rapid technological progress, 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 to the remotest and the most backward areas.

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 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.

EVALUATING HUMAN RESOURCE MANAGEMENT ISSUE IN HEALTHCARE

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 help 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. Much of the developed world has demonstrated 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, along with addressing the new demands on the skills of health professionals.

BENEFITS OF INCORPORATING ICT IN HEALTH CARE:

Quality of care for individual patients:

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

Engagement of patients in healthcare:

The participation of patients in their own healthcare could substantially improve their care, especially in the management and treatment of chronic conditions such as 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 settings, 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 invaluJable 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 outpourJing 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, administraJtive 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 daily wage. ICT in healthcare can enable remote consultation, diagnosis and treatment through telemedicine

Explore new ways of structuring work processes

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:

The Compliance service uses 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 other 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 technolog-

ical capability, suitable for remote areas with limited infrastructure. Rural Peru was chosen for the Alerta pilot project as it was an ideal environment for testing the data collection system in relatively isolated conditions, and 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 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 completing paper 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 in rural areas. Providers and users are able to interact asynchronously through forwarded voicemail to one or many users. Additionally, Alerta can play a key role in forming a baseline for disease behaviour in remote ar-

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

Personal Digital Assistants (PDA), India

Personal Digital Assistants have been used by auxiliary nurse midwives (ANMs) in India resulting in the reduction of paperwork, increased data accuracy and have ensured the broader availability of data in electronic form. It is now possible, using Personal Digital Assistants (PDA), to transmit data through wireless communication 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 sup-

port under not-for profit contractual arrangements. Launched in 2007, MHIN is currently operating in 68 health centres located in five districts of Mozambique.

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

■ To replacepaper-based health data collection processes withcomputer-based systems to collect, report and

■ To speed up the reporting of health data from rural

■ To improve the accuracy of reported public healthdata

■ 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 or 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 been patchy, at best, India – with different states showing 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 successfully 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 "1-0-8 Emergency service". This is a free service delivered through state- of -art emergency call response centers and 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 use of ICT.

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 remote areas either do not have access to even basic healthcare facilities, or expensive treatment at private institutions makes places them out of their reach. Hence the key question is can ICT

help in making healthcare 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. Can ICT help in simplifying health information architecture management?

The challenge of infrastructure (especially 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, lack of trained medical staff are some of the issues which need to be tackled for ICT being a success in the healthcare sector. How can some of these imperatives be institutionalised for ensuring more uniform progress across state and jurisdiction boundaries? END

CHAIR

SPEAKERS ↘

PROF. JORN BRAA
UNIVERSITY OF OSLO,
NORWAY

DR. PANKAJ GUPTA
PARTNER, TAURUS GLOCAL
CONSULTING, INDIA

MR. K.N. DESIRAJU
ADDITIONAL SECRETARY,
MINISTRY OF HEALTH
& FAMILY WELFARE,
GOVERNMENT OF INDIA

INSTITUTIONALISING
THE USE OF ICT FOR
BETTER HEALTHCARE

SUMMARY OF THE DISCUSSION

The first session in the health theme, moderated by **Mr. KN Desiraju**, focused on how the use of ICT can be institutionalised for better healthcare. Kicking off the discussion, Mr. Desiraju talked about the mother and child tracking system (MCTS) undertaken by the Indian Ministry of Health. "Even though registration of pregnant women takes place, the follow up

for continuing care gets missed out due to various factors. Hence, the need to build a more efficient system to follow up on ante natal, post natal and infant care was required," he explained. The focus of this project was to keep track of each pregnant woman from registration to post natal care. The project has been recognised in various international forums and has been awarded the "Top 11 in 2011 Innovators challenge award" instituted by the Rockefeller Foundation and mHealth Alliance of America.

Mr. B. Selva Kumar told the audience about a

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ADDITIONAL SECRETARY, DEPARTMENT OF HEALTH & FAMILY WELFARE, GOVERNMENT OF TAMIL NADU, INDIA

MR. B. SELVA KUMAR
MISSION DIRECTOR, NRHM, GOVERNMENT OF KARNATAKA, INDIA

project, in association with Narayan Nethralaya, called the Karnataka Internet Assisted Diagnosis of ROP, which is the first and the largest tele-ROP network in the world. "With the help of this initiative we have been able to save pre mature babies and have been able to bring down infant mortality rate in Karnataka", he said.

Prof. Jørn Braa shared the details of a project that he helped implement in Kenya wherein they used data warehousing on cloud. "This was the first-of-its-kind national web-based data warehouse for health data implemented, using cloud infrastructure. The aim of the project was to improve data use and ownership at the local level. The project also tried to improve the overall quality of data at the national level," Prof. Braa said. The biggest challenge to the project was the big cultural change that it entailed. The system replaced the existing platform that managed data by district, to now managing data by facility. Therefore, from

managing 149 systems in the past, the system now had to manage 7000 reporting units.

"There was also a shift from managing data using spreadsheets to using integrated database. The direct benefit from doing this was the improvement in data quality and ability to execute integrated analysis," Prof. Braa added. Ownership and location of data in the cloud, it was realised, could be a political issue. Local ownership of data, therefore, radically improved the situation. The project helped in integrating software instances in all districts and facilities into a single nation-wide implementation.

Dr. Pankaj Gupta talked about how India has traditionally been extremely innovative but how the innovative spirit has not permeated into the modern way of life. He said that India has been very ingenious in finding workarounds but that we have lost this ingenuity along the way to modernisation, and that those organisations that are not 'ground up' for innovation will no longer be creative in a changed scenario, since innovation can be extraordinarily disruptive. Hence a culture of innovation has to be nurtured in the country, for which all stakeholders must work together to select and deploy innovative improvements that measurably improve service quality and provide truly 'out of the box' thinking to the country.

Dr. Gupta said, "Our aim is to get that innovation back in our life so that we can develop innovative solutions not just in limited sectors

but also in healthcare. To do that, the National Innovation Council has been created to promote innovation in the country", he said. "We all know when biological science met IT and the human genome project became a reality. Similarly when imaging industry worked with healthcare, medical imaging was made possible. A similar promise holds true when IT meets healthcare," Dr. Gupta said.

He said that we need a quantum leap in planning in order to achieve this level of innovation in eHealth, along with a plan as to where we want to be in this journey and then work backwards from there, taking all the intermediate steps to achieve the various milestones that would help us reach there. He talked about how their research showed that all public health IT systems in the country are in silos. Programmes/directorates / states have their own IT solutions for program reporting needs. Since all systems work in silos they do not assist in integrated decision making. There is also a lack of standardisation in architecture, data standards, disease and service codes etc. The proposed national eHealth authority will lay down the national eHealth architecture, he said, talking about the proposed national health information network. **[For his full presentation, please see http://bit.ly/OoT9rc]**

Mr. Pankaj Bansal talked about health management systems (HMS) and health information management systems (HIMS), presenting a case study on a mother and child tracking system (MCTS) implemented in Tamil Nadu. Tamil Nadu has a three-tier healthcare delivery system.

When biological science met IT, the human genome project became a reality. Similarly when imaging industry worked with healthcare, medical imaging was made possible. A similar promise holds true when IT meets healthcare

The primary care comes under the Directorate of Public Health and Preventive Medicine. Secondary care falls under the Directorate of Medical and Rural Health Services. Finally, the tertiary care comes under the Directorate of Medical Education.

"Before the project launch in Tamil Nadu, there was no real-time data available to monitor the performance of the hospital. Evidence-based program management was a challenge and there were also undue delays in the receipt of data. Retrieval of old manual records was ineffective and time consuming and duplication of records was again a setback within the hospital," Mr. Bansal explained.

The initiative taken by Mr. Bansal and his team was to create a centralised web-based application, build the right IT infrastructure for eHealth and to effectively utilise the existing infrastructure investments done by the state government, namely, the state data center. The application was developed and implemented by TCS with the Government of Tamil Nadu as the owner of the application. "The deployment created a paradigm shift in Tamil Nadu. We automated the workflow process at hospitals, removed manual records from hospitals and were able to achieve real time monitoring of the performance of each hospital. With the project, we could also standardise the health systems and processes", he told the audience. END

SIMPLIFYING HEALTH INFORMATION ARCHITECTURE MANAGEMENT

CHAIR

PROF. JORN BRAA
UNIVERSITY OF OSLO, NORWAY

SPEAKERS

PROF. HIROSHI TAKEDA
DEAN & PROFESSOR MASTER COURSE OF SAFETY MANAGEMENT IN HEALTHCARE SERVICES, JIKEI INSTITUTE, OSAKA, JAPAN

MR. ASHOK CHANDAVARKAR
HEALTHCARE INDUSTRY MANAGER, ASIA-PACIFIC, INTEL

SUMMARY OF THE DISCUSSION

Prof. Hiroshi Takeda presented his talk on "e-health: a global perspective of medical informatics". According to Prof. Takeda, there are four key elements of a healthcare process, which include data acquisition, data action, data integration and decision making. However, he suggested that in the real world, hospital information systems are a lot more complicated and include various other things including billing/accounting, inspection, safety management, nutrition, pharmacy, nursing, logistics, financial management and safety management. "A huge amount of data is generated, processed, managed and archived day-by-day through this system. HIMS has been there since 1970s, which started from stand alone accounting systems at hospitals, then it turned from a data handling to a data based medicine and management system", he said. According to Prof. Takeda, HIMS is moving from information systems

in silos to network-based integrated solutions. Prof. Takeda cited the example of Osaka University Hospital where he served as the Chief Medical Information Officer. The HIMS in Osaka University Hospital started in 1993. In 2001, the hospital deployed Filmless picture archival system or PACS. Since, 2010 the hospital has also launched a paperless medical record system. "The paperless system in the hospital has brought about a complete paradigm shift. The system is now a lot more efficient and extremely effective," Prof. Takeda explained.

At Osaka University Hospital, he said, we moved from Phase One where the information system was in just one section, to Phase Two where there was an interconnect between information systems of different departments. In Phase Three, there was a completely centralised hospital information system. Phase Four extended the information system to several hospitals and clinics. Finally Phase Five would have the information system collect not only medical information but also health check and welfare information.

Mr. Ashok Chandavarkar said that, "One of the most important things that any healthcare information system needs to have is a solution blueprint. Most hospitals go ahead and implement solutions without a blueprint, which results in interoperability issues." He suggested that one needs to also have informatics standards but they need to be time controlled—too much time should not be spent building the standards, but should rather be used in focusing on executing the solution. Overall, he said that apart from the need for a solution blueprint for interoperability, what is also required are informatics standards, security across the entire computing continuum, service-oriented architecture, scalability via the cloud, and a sustainable business model that provides flexibility to include local priorities while adhering to the solution blueprint. Another important salient feature for a HIMS, according to Mr. Chandavarkar, is service-oriented architecture. He believes this to be an important aspect of a healthcare system because unless the system uses service-oriented architecture, there can be scalability issues and the system would have challenges moving to the cloud. When it comes to cloud, the industry needs to decide whether public, private or a hybrid cloud would be suitable. "Finally, the system needs to be flexible, should be able to take local inputs while adhering to the solution blueprint. Therefore, there must be a sustainable business model built around the system," he added. He said that by the year 2015 there will be over one billion more netizens, over 15 billion connected devices and over one zetabyte of internet traffic, which would pose significant challenges to efficiency, security and resource capabilities.

According to Mr. Chandavarkar, in the case of a cloud, the system needs to be client aware, which means that it should recognise what device is trying to access the information from the cloud and, based on the device capabilities, the cloud should optimise its services. He insisted that the cloud also needs to be federated, implying that data should be shared securely across public and private clouds. Also, the cloud needs to be automated so that IT can focus more on innovation and less on management.

Mr. Chandavarkar highlighted the importance of building an open data center architecture, which should be focused on openness and one which is interoperable, flexible and provides choices. Simplified data center operations were required to reduce cables, complexity and cost, which must be secure to reduce risk, increase compliance and better manage hybrid usage models. He said that technology is only an enabler and user experience matters. He suggested that one needs to own the business model and not just CAPEX—the focus needs to be on total cost of ownership. He concluded by mentioning that as we move towards compute continuum, security would be the key to success. END

[For his full presentation, please see http://bit.ly/ LaTLEb]

USING INFORMATION TECHNOLOGY TO IMPROVE
HEALTH OUTCOMES &
TRANSFORMING SERVICE DELIVERY CHANNELS

CHAIR

PROF. SUNDEEP SAHAY
UNIVERSITY OF OSLO, NORWAY

SPEAKERS

Dr. A.K. AZAD
ADDITIONAL DIRECTOR GENERAL (PLANNING & DEVELOPMENT) & DIRECTOR, MANAGEMENT INFORMATION SYSTEM (MIS), GOVERNMENT OF BANGLADESH

DR. JOHN LEWIS
VICE PRESIDENT, HEALTH INFORMATION SYSTEMS PROGRAMME (HISP), INDIA

SUMMARY OF THE DISCUSSION

The session focused on using Information Technology to improve health outcomes and transforming service delivery channels. Opening the discussion, **Dr. AK Azad** described the health infrastructure in Bangladesh, with its 600 public hospitals, 19,000 day-care facilities and about a 100,000-strong healthcare workforce. Bangladesh has made impressive strides in e-health in the last three years, he said. In 2008, there was no internet connection in healthcare facilities in Bangladesh, all forms were in paper, there was no alternate power supply (even though there were frequent power cuts), work environment was poor and healthcare staff was unskilled and frustrated. Information collection used to take two months, because all documents had to travel through snail mail.

In 2009, the government of Bangladesh planned to improve physical healthcare facility, improve ICT backbone and data communication system and also improve staff skills and motivation. "On 22 March, 2009, our health minister announced the healthcare transformation plan with an aim to improve health systems efficiency, to bridge the urban-rural digital divide and to reach the citizens," Dr. Azad informed the audience. "However, achieving this goal was not easy as there were resource constraints, competing health priorities and a shortage of skilled ICT staff. Therefore, our IT systems had to be simple, low cost, innovative, locally appropriate and scalable," he added.
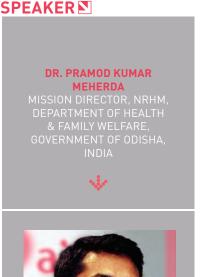
To make it easier for women to seek health care advice for themselves and their children, the health department of Bangladesh provided mobile phones to all district and sub district hospitals—a total of 482 hospitals. People can call 24 hours a day and 7 days a week to get free medical advice from on-duty doctors. "We are also testing high quality telemedicine in 20 Union Information and Service Centres (UISCs) and plan to scale it to 4500 UISCs. Tele-medicine would also help in updating health data, spreading health seducation, training health staff and also enable communication and Internet browsing," Dr. Azad said.

Dr. Pramod Kumar Meherda talked about the e-Blood Bank initiative undertaken by the Department of Health & Family Welfare, Government of Odisha. In Orissa, there are 82 blood banks. There are however, many challenges in the manual system at the blood banks.

"First of all there was no centralised donor database and therefore individual blood banks maintained their own lists. Secondly, the public had no easy access to know real-time

SPEAKER

DR. PRAMOD KUMAR MEHERDA
MISSION DIRECTOR, NRHM, DEPARTMENT OF HEALTH & FAMILY WELFARE, GOVERNMENT OF ODISHA, INDIA

stock of blood units of various groups in a particular blood bank. Moreover, there was a lack of real-time facility to know collection versus issue status by state level administration. There were many more issues beyond these," Dr. Meherda said. The e-Blood bank initiative was therefore started with an objective to minimise the observed gaps through automation and integration of all available processes. The initiative also aimed at getting additional inputs to improve the quality and standard of blood bank services. For example, the unique identification code of donor and tracking of tube serial number through bar coding of blood units etc.

The salient features of the e-Blood bank in Orissa included an online service dedicated to the public to provide the status of group-wise availability of blood units in all the licensed blood banks in the state. It also enables online tracking and trailing of the collected blood units and blood products (components of blood). The system also arranges all the activities from blood collection both from camps and hospitals till the issue of blood units. It includes donor screening, blood collection, mandatory testing, storage and issue of the blood units (whole human blood, different blood components and aphaeresis of blood products). "Now in Orissa we have a single donor database for blood banking in the state, interlinking of blood banks is done, performance of any blood bank can be easily evaluated and short expiry kits, bags and reagents can be traced and transferred to other blood banks requiring the same.," Dr. Meherda said. In addition to this, the e-Blood bank also provides online donor registration, area-wise blood demand, online status of e-camp registration,

Bangladesh is testing high quality telemedicine in 20 Union Information and Service Centres and plans to scale it to 4500 UISCs. Tele-medicine helps in updating health data, spreading education, training staff and enabling communication

blood donation camp calendar and FAQs on blood donation. Documents and forms for blood donation and blood donation camps can be downloaded, and contact details of all blood banks are readily available.

Dr. John Lewis explained the offerings from Capacity Plus in the health domain. He primarily talked about the iHRIS suite, which is a human resource management system, training and licensure tracking database, workforce planning and modelling system, and workforce retention intervention costing tool. Giving his opinion on strategies for sustainability, Dr. Lewis said, "The key for sustainability is the leadership and ownership by the country that can strengthen health workforce observatories. It is also important to make information public and use a regional approach." END

[For his full presentation, please go to http://bit.ly/ N4LM7r]

ICT FOR
HUMAN RESOURCE MANAGEMENT IN HEALTH

CHAIR

PROF. JORN BRAA
UNIVERSITY OF OSLO,
NORWAY

SPEAKERS

PROF. KAYODE ODUSOTE
CEO, FOUNDATION FOR
SUSTAINABLE HEALTH
DEVELOPMENT, NIGERIA

DR. CARL LEITNER
OPEN SOURCE DEVELOPER,
CAPACITYPLUS PROJECT
AT INTRAHEALTH
INTERNATIONAL, USA

SUMMARY OF THE DISCUSSION

Dr. Carl Leitner opened the session by talking about the benefits of using open source tools in human resource management in the healthcare sector. He explained how open source can avoid vendor lock-in. He clarified that open source is not zero cost as there would be trainings costs etc. Dr. Leitner also talked about some of the challenges they faced in some of the deployments in Africa. "In Botswana there are about 21,000 health workers including both public and private sector. Some of the challenges are in the human resource management. There were issues in the quality of data and it was essential to clean up the data and get them reconciled to make sure that data in every data set is accurate. But once that is done, it is much easier to maintain," Dr. Leitner said.

DR. INDRANOSHEE DAS
OFFICER ON SPECIAL DUTY, NRHM, DEPARTMENT OF HEALTH & FAMILY WELFARE, GOVERNMENT OF ASSAM, INDIA

Dr. Indranoshee Das focused her presentation on some of the IT initiatives taken by the National Rural Health Mission (NRHM), a centrally-sponsored rural health scheme in India. The areas she touched upon were human resource management, online e-HRMIS database, Web-GIS based planning and facility management system, online maternal death reporting system, 104 helpline and e-CRS system, implementation of Tally synchronisation, website of NRHM, Assam and projects under process.

The Government of Assam, she said, has adopted a multidimensional strategy for effective human resource management. With the implementation of e-HRMIS system, all manpower under Department of Health and Family Welfare, both contractual engagement under NRHMIS as well as regular appointments under Department of Health and Family Welfare have been captured under the system. As a future roadmap, performance data of individual employees is proposed to be captured in the online e-HRMIS portal. It will help in the process of annual appraisal system. NRHM Assam has also adopted Web-GIS based planning and facility management system.

Another IT implementation discussed by Dr. Das was online maternal death reporting system. The online maternal death reporting system is developed and the summary report is published on NRHM, Assam website for public viewing. "Whenever maternal death occurs, it is entered in the online maternal death reporting system. The system has been found very helpful for regular monitoring of maternal deaths occurred," Dr. Das said.

Dr. Das also explained the implementation of Sarathi 104, the health information helpline in Assam. 104 Sarathi is a 24-hour, free of cost health contact centre. It provides four key services: medical advice using triage (classifying the caller's condition into critical, serious, or stable states) and providing appropriate ad-

vice; counselling services (including but not limited to HIV/AIDS, matrimonial discord, depression, chronic diseases, psychological distress and suicide prevention); directory information (information about health service providers); and complaint registry (citizens can register complaints against any public health provider).

Prof. Kayode Odusote made a presentation on 'The role of ICT in the Management of Human Resources for Health (HRH) – Sub-Saharan African Perspective'. He talked about the HRH crisis and the health-related Millennium Development Goals (MDGs), while listing the contributing factors to the HRH crisis. These include negative fiscal policies leading to freeze on recruitment, salaries and allowances; reduced spending on training and poor HRH management, resulting in poor motivation and job satisfaction; inequitable and less transparent performance evaluation and reward system and both internal and external brain drain. He said that this was compounded by the lack of credible, reliable and up-to-date information on health workers, government underfunding, limited training institutes and non-functional Human Resource Information System (HRIS).

Projections for HRH needs were based on lack of information and staffing norms based on empirical guess-estimates. Talking about the regional deployment of iHRIS in West Africa, he said that most countries' workforce information was part of the national personnel payroll information system but none had a functional

> **Contributing factors to human resources in health crisis include negative fiscal policies leading to freeze on recruitment, salaries and allowances and reduced spending on training and poor HRH management, resulting in poor motivation and job satisfaction.**

HRIS that provided up-to-date, real-time information on the HRH situation. Now, open source software, developed by the USAID-funded Capacity Project and now CapacityPlus, both led by Intra-Health International is in use in countries in East Africa and Asia, which meets the need for up-to-date, real-time HRH Information for decision-making. While talking about the pilot projects implemented for iHRIS, and sharing examples of the regional deployment of the same, he talked about some of the challenges of the use of ICT. These can be met by the appropriate choice of applications that can help with appropriate and affordable solutions; lead to ease of use and low maintenance and avoid vendor lock-in, as well as improve human resources with the help of IT officers and the training of users and better communication and equipment for fostering a culture of use of information.

He concluded by saying that HR management in Sub-Saharan Africa has many challenges and the most important is to have credible, reliable and up-to-date HRIS, for which there are many ICT tools that are available to meet these challenges, including iHRIS which, is being widely deployed in West Africa. He said that moving forward requires, most importantly, political will at the ministerial level and having an ICT policy for health, along with strong partnerships and collaboration. END

SPECIAL PRESENTATIONS

CHAIR

PROF. ANA PONT
POLYTECHNIC UNIVERSITY
OF VALENCIA, SPAIN

The special presentations discussed the open government platform (OGPL) and cloud computing, offering a perspective each from the government and the private sector.

Mrs. Neeta Verma of the NIC talked about the open government platform, which, she said, is basically designed to help institutions launch their open data initiatives. It helps them publish their data sets in an open format, where those data sets can be used and redistributed without licensing or any special software. The platform is generic enough to publish any kind of data sets for any sector, across social development to business sectors and scientific data. The government can develop catalogues for all types of data like documents, forms, acts, policies, and public services, and maintain and manage the same using these platforms. "On the citizen side, it can provide a single point access to all the published catalogues of the data sets and documents, as well as develop apps around these data sets or directly consume these data sets in their existing applications using web services." A visitor-citizen relationship management system can be built through which, on a single dashboard, all the input received can be assigned to various people who have to address it, ensuring better monitoring. The major problem with many government platforms, she said, is that the feedback given to the government is not normally responded to, and this allows a tracking of the same. These data sets can be stored on the individual websites of those departments or they can be stored in a local store of the open government platform itself, depending on whether it is generic enough to be used across the world by many countries or institutions.

As far as the OGPL metadata is concerned, it is basically a three-tiered metadata schema: a core to help a user ascertain what kind of data it is; how it was collected; and how it can be accessed to help build meaningful applications around it. Then there is an administrated component of the metadata, which shows how it has been contributed and by whom. The complete project has been managed using open source. It is highly configurable and customisable, with functionalities that can easily be turned off or on. The OGPL has been

built with a strong component of citizen engagement, with provision for transparent and open feedback from citizens that is visible to all. These data sets can also be embedded into websites, blogs or published directly to social media pages. The simple interface allows users to view a dataset's popularity, number of views, user ratings and the rating averages, while allowing them to apply filters or directly contact those who have contributed the data. The data can be rated along three parameters – quality, accessibility as well as its usability, with social media sharing allowing citizens to extend the reach of the data already published.

There is also an embedded component of transparency, she explained. Just like the national portal that was launched in 2005, all inputs received from citizens are recorded and classified, and tracked for resolution. It is also tracked via analytics to show usage patterns and traffic, which is a part of the platform on a single dashboard. OGPL can be used by the central and state governments, district-level departments, municipal councils, NGOs, and private organisations, and can be offered as a service on a cloud-based model, with the provision to make customised catalogues via the website ogpl.gov.in. Soon the source code of this will be made available in open source. The project was finalised during US President Barack Obama's visit to India in 2010, when it was decided to build an open government platform via bilateral collaboration using online tools and the best practices of India's national portal and the USA's

data.gov. It is viewed by both the governments as a new model of collaboration in developing software at a low cost and at high speed, so that time is not wasted in travelling from one country to another. Transparency was an integral component of the partnership, and everything was made in an open domain. She concluded by saying that the platform fosters accountability and transparency, even as citizen relationships are

SPEAKERS ⬁

MR. CHRIS HOPFENSPERGER
TECHNOLOGY POLICY COUNCIL, BUSINESS SOFTWARE ALLIANCE (BSA)

MRS. NEETA VERMA
NATIONAL INFORMATICS CENTRE (NIC)

maintained.

COMMENTS FROM THE FLOOR

One of the participants made the point that though it's a great thing to make a platform available for government departments of India and the US to put data online, the next two steps could be to make a

data warehouse, by integrating various data marts from various departments that require metadata definition for the entire warehouse. Once you have all these metadata definitions you can venture into analytics, business intelligence and forecasting, which can all be made available on the portal itself. Mrs. Verma replied by saying that India has recently announced a open data policy and once the government issues further directives regarding the same, these features, which are already in place, will be released.

Another participant wanted to know if visualisation, graphic interface and the presentation of data were based on any study to check whether the same were culturally determined and differently interpreted. Mrs. Verma replied saying that there was a huge component of citizenship and community engagement and that once it is released to open source, more contributions from communities from around the world are likely to follow.

Another participant wanted to know whether private industries where these data sets can be used had been indentified, for example, in the e-commerce industry or in online travel portals and what plans had been made to ensure the data quality or strong data community modules. Mrs. Verma said that the product was built on the philosophy of social audit and self regulation, meaning that they have to be contributed by agencies, citizens and communities, which are allowed to rate them and that there were plans to set up an open data management advisory council to look into such matters. Secondly, in terms of data sets, whatever data government has, it has col-

The OGPL has been built with a strong component of citizen engagement, with provision for transparent feedback from citizens that's visible to all, where data sets can be embedded into websites or published via social media.

lected by using taxpayers' money and thus, it must be made open. But any applications will most likely use innovative combinations of government and private data and such facilitations will happen automatically as it grows with time.

Mr. Chris Hopfensperger's presentation focused on the Business Software Alliance's (BSA) global cloud computing scorecard. He said that BSA had undertaken a study of cloud computing because of its revolutionary importance to the software industry, consumers and developers of the platforms alike. The cloud offers a tremendous opportunity while putting the power of computing into the hands of end users, allowing for the localisation of solutions. It allows you to build from the bottom up, to locate a problem and solve it by customising the solution and using it in your own way. But taking advantage of cloud, he said, requires the government to institute the right kind of policies, within a global economy.

Several years ago, BSA had developed a series of cloud policy guidelines and best practices for the cloud, centred on seven factors – data, privacy, security, cyber crime, intellectual property rights, support for international standards and harmonisation of rules, promoting free trade and ICT readiness broadness deployment. Talking about data privacy, he suggested that this should focus on rules that ensure that the person's data is not used in an unusual way, while allowing for the development of international commerce and international trade. Cyber security ensures that the right security measures are used, without prescribing a certain manner of security. It is important to have cyber crime laws

because there is going to be a lot of data in the cloud, for which people require trust and confidence. Governments and individuals can go after the people who use data improperly. The cloud has the kind of intellectual property rights that allow people to promote innovation and he said that IP rights are very important in building the kind of innovation that allows the global growth of clouds. Support for international standards and harmonisation of rules is important because you need the clouds to work together around the world Within the context of India, he talked about three 'score cards'. The first is privacy and its importance. India has privacy rules, which is a strong start, as many countries don't, which is an area of concern as these rules are unique to India and it doesn't necessarily fit into a broader regime for collaboration. Cyber crime is another area. A yardstick used here is that of the International Convention on Cyber Crime. India is not a member but again it has good cyber crime laws that match a lot of provisions in the Convention, as it uses best practices. The third is ICT infrastructure, which has been encouraged by the national broadband plan in India and the work that's being done here. He said that BSA encourages similar efforts around the world.

Finally, he said, that when they talk to government officials they suggest strong privacy protection and rules that allow global free trade around the world. He said that there was a need to promote innovation in the cloud in the same way as anywhere else in the world: by having strong protection for intellectual property rights and prevention of cyber crime. He reiterated BSA's belief in the unlimited potential of the cloud and encouraged participants to look at the online score card at *http://portal.bsa.org/cloudscore-*

The cloud puts the power of computing into the hands of end users, allowing for the localisation of solutions. You can build from the bottom up, locate a problem and solve it by customising it.

card2012/.
(For his full presentation, please see http://bit.ly/N2MSQE for part I & http://bit.ly/Nk-22RA for part II)

COMMENTS FROM THE FLOOR

One participant asked him about the kind of legal structure that would have to be put in place, including the role of multilateral organisations like the UN and ITU, as well as how this can be globally managed in the absence of a global legal framework. Mr. Hopfensperger replied saying that the best way to handle privacy would be via governments and inter-governmental relations. He said he didn't believe that there was a requirement for a single global privacy framework. Countries should be allowed to develop privacy regimes based on their core system of competencies, as it would be too big a responsibility for a single group or entity. Replying to a question on intellectual property rights on the cloud, he said that they were the core that protects the very heart of innovation and even though BSA did not have the historical privacy concerns that other companies have, it would work just like IPR protection does on the internet. He said he believed that this kind of protection would continue to be spread across the cloud, being an important element of promoting innovation in the country and around the world. END
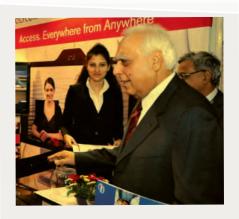
For more information on the OGPL, please visit http://ogpl.gov.in. For more information on the National Informatics Centre, please visit http://nic.in. To know more about the Business Software Alliance's global cloud computing scorecard, please visit http://portal.bsa.org/cloudscorecard2012/.

Union Minister of Communications and IT and HRD, Shri **KAPIL SIBAL,** and Minister of State of Communications and IT, Shri **SACHIN PILOT**, at **WITFOR 2012**
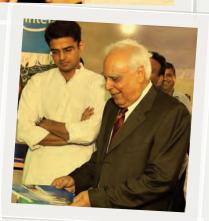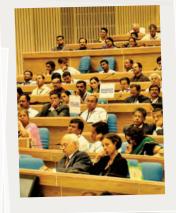
PARTICIPANTS from India and around the globe at **WITFOR 2012**

PROF. CHRISANTHI AVGEROU
PROFESSOR, LONDON SCHOOL OF ECONOMICS, AND CO-CHAIR, INTERNATIONAL PROGRAMME COMMITTEE, WITFOR 2012

Conference Summary

P rof. Avgerou talked about the lessons that she had picked up from the sessions at WITFOR 2012, saying that WIT-FOR in India was always going to be quite special and that being an academic she wanted to formulate key research questions that can be gleaned from the deliberations at WITFOR. India is an economy and society, she said, that is developing very fast and, unlike other countries where WITFOR has been (like those in Africa and Vietnam), it has an advanced economy and technological capacity. In many ways it is at the frontier of technological know-how, being a technological leader among countries even as it poses a huge challenge in terms of development.

What has impressed her about India, she said, is that it is going ahead with technology-led development interventions, across the board, which marks the beginning of a new era as far as the vision and implementation of technology-led development projects is concerned. She referred to the Union Minister of Communications & IT's Inaugural Address where he spoke about the laying of broadband infrastructure; content and the vision of an industry that will produce affordable devices; large scale application projects like the UID project; the government's efforts to provide better public services; open government and even the promotion of democracy, and talked about the potential that all of this holds. The vision of tech-

nology, she said, is to reach the poorest of the poor and connect remote villages, which is both a remarkable aspiration and a big challenge. It was important to ask how technology can lift people out of poverty, improving the quality of lives, talking about the increasing gap between the poor and the rich, and saying that it was imperative to ensure that technology reaches remote locations and helps improve their productivity. She said that a 'knowledge society' did not necessarily improve the lives of the underprivileged and, referring to the aspirational deliberations at WITFOR 2012 in this regard, she said that there was a need to determine what further policies and interventions are needed so that the potential of technology is materialised, while reiterating the need to watch issues of economic development very carefully. Technology is merely an enabler and there is a need to focus on issues like employment and on sectors that can reach out to the unskilled to provide them work, she said. Also, she said that, enabled by technology, researchers are now better equipped to make suggestions on what can be done.

Technology, she cautioned, often brings with it the 'creative destruction' of existing industries, which is especially of interest in a country like India that has a significant industry presence. Competing in the global economy offers great opportunities as well as significant risks, she said, referring to the issue of 'jobless growth', which requires attention. She referred to Mr. Arun Maira's intervention about the need for institutional development and change, saying that there was a lack of knowledge about the kind of change that was required in a competitive economy that is seeking to innovate – something that she hoped India would be able to teach the rest of the world.

She said there were other issues and contradictions that need to be considered, like those related to social media, the use of which can be revolutionary at the individual level while having quite the opposite effect in helping the State to maintain the existing balance. Also she expressed her concern at the imbalance between the active users and passive consumers of social media, and the kind of implications this has on democracy. The State faces various challenges in its efforts to reach out to citizens, saying that technology on its own does not bring transparency or reduce corruption and requires dedicated efforts to bring about change. Given the mobilisation, she concluded, that has begun – variously, at the State, citizen and industry levels – the battle was only just beginning. END

MR J SATYANARAYANA
SECRETARY, DEPARTMENT
OF ELECTRONICS AND
INFORMATION TECHNOLOGY
GOVERNMENT OF INDIA

Address and hand over for **WITFOR 2013**

Mr. Satyanarayana acknowledged the massive effort that had been put in on behalf of the organisers of WITFOR to bring it together, with eminent speakers addressing issues relating to financial inclusion, citizen engagement, open government and the future of technology in various sectors like agriculture, education, healthcare and e-governance.

He said that though the conference probably would not – due to time constraints – have been able to generate final solutions in the areas under discussion, it had thrown up a number of relevant and valid issues, while suggesting some solutions. It is important to remember that ICT is subservient to the needs of development, and is only a facilitator. Once we are clear about what we want to do, we could use ICT as one of the means, he said, and that it was important to keep an eye not just on the means but on the ends. He stressed the need for effective leadership, echoing the sentiments of many of the speakers.

He said that though a small beginning had been made, there were still a number of issues that remain unaddressed and provide ample food for thought in the future. For example, this includes issues like how to address the problems of the poorest of the poor and what needs to be done for them, saying that the "best solution should not be the enemy of a good solution". Whatever we can do with available resources, he said, we should be able to, while addressing the questions of universal coverage at a later point, when we are capable of doing so. END

PROF. BENJAMIN BARAN
RESEARCH AND
INNOVATION COORDINATOR,
FUNDACIÓN PARQUE
TECNOLÓGICO ITAIPU - FPTI
& INTERNATIONAL
PROGRAMME CO-CHAIR,
WITFOR 2013

Address and take over of **WITFOR 2013**

Prof. Baran thanked the organisers for the opportunity for Paraguay to host WITFOR 2013, the first time that it is being hosted in Latin America, and extended an invitation to everyone for next year (June 6-7, 2013 in Asuncion). He talked about the uniqueness of Paraguay and gave a few examples of the use of ICT in his country. He talked about the ITAIPU Hydroelectric Dam, which is the largest hydroelectric power station of the world in energy production, generating almost 95 TWH annually, using the latest ICT technology. He informed the audience about the Paraguayan ICT Master Plan which includes e-government, infrastructure, human resource, research and development, ICT, e-commerce, standards, ICT awareness, legal framework and ICT organisation.

He said that Paraguay puts in a lot of work into increasing the efficiency of ICT and helping it to develop the country. He also apprised the audience of the Paraguayan Metropolitan Public Sector Network that connects all the country's public institutions, which has enabled Paraguay to build an information system that has centralised all the public information. The government has its own fibre network that connects all the ministers and public universities and this has been an achievement for the country, he said. But he said that there is still a lot of work to do for a small country of 6 million people, especially at forums like WITFOR. END
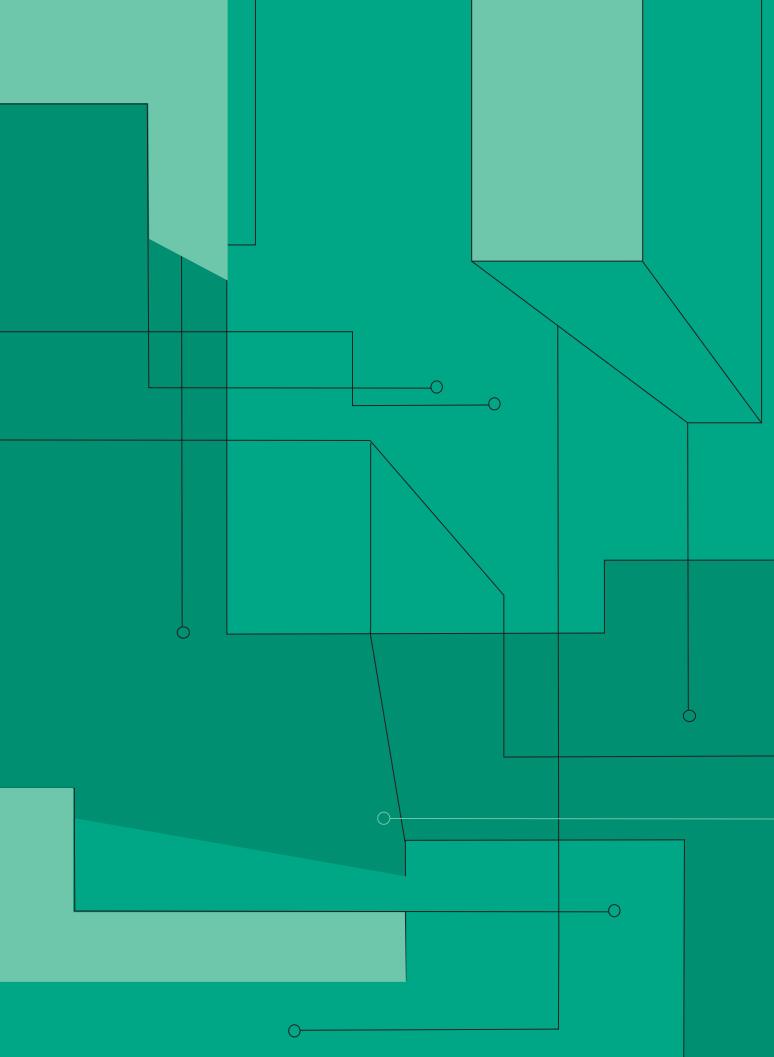
MS. RITA TEAOTIA
ADDITIONAL SECRETARY,
DEPARTMENT OF
ELECTRONICS & IT,
GOVERNMENT OF INDIA

Vote of Thanks

Mrs. Teaotia said that WITFOR 2012 saw the gathering of over 1200 people from across the world including policymakers, academics, ICT professionals, knowledge leaders and members of civil society and exhibitions of e-governance projects implemented in the country and elsewhere. The conference provided its participants with an opportunity to re-assess the extent of the use of ICT in various areas, especially in health, e-governance, education and agriculture. She said that the clear message that ICT was a tool to deliver public services had resounded throughout the conference. She thanked the Union and State Ministers for ICT for extending their support to the conference and for their support and guidance to the DIT in all it does.

She thanked the Secretary, IT; members of the International Programme Committee; colleagues at the DIT; and 9.9 Media for its coordination with speakers and delegates. Saying that the goal of WITFOR was to identify, showcase and discuss projects that are replicable and scalable, she thanked all the speakers and delegates, as well as all exhibitors and sponsors from all parts of the world for their enthusiastic participation. She extended her gratitude to the Director-General of NIC for facilitating the live webcasts of the conference; logistics partners Kuoni Destination Management and those at Vigyan Bhawan, as well as the media for the extensive coverage of the Forum. She ended with the hope that the discussions would be continued at WITFOR 2013 in Paraguay. END

CONTENTS

DE(CODING) THE POOR:
TOWARDS A TRANSPARENT AND ACCOUNTABLE NREGA INFORMATION INFRASTRUCTURE

by Sumitra Nair and Nimmi Rangaswamy, India

Pramila (46) of Badh village, turns up at the village's MGNREGA supported well-building worksite and walks up straight to Lateral Praxis's field engineer to report her attendance, ready for work. He gets her thumbprint on his EMuster-enabled biometric device, and then asks her some questions: name, age, household head, '(does she) know the registration number?' He enters her answers in, and quickly fills in other details while she waits: state, district, block, village, category, work name, muster number, start date, end date. 'Update.' 'Send.' The device produces some more new numbers: total attendance, total payment. 'Print.' It spits out a time-stamped paper stub. Pramila tucks it into her blouse for safekeeping, and gets to work, stacking bricks. She is now 'synced' with EMuster. And later, at midnight, EMuster will 'sync' her with NREGAsoft.

1. INTRODUCTION

The scenario above describes a mediated interaction between two individuals and the technical components of an e-governance information infrastructure. The components in this case are the two information systems, the NREGAsoft and EMuster. This paper examines the information infrastructure produced by Government of India's flagship poverty eradication tool, the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA, 2005). This justiciable act, grants the rural citizen the right to work, and aims the 'to provide for enhance-ment of livelihood and security of the households in the rural areas of the country by providing at least one hundred days of guaranteed wage employment in every financial year to every household whose adult members volunteer to do unskilled manual work.' (DoRD, 2005)

Launched in 2005, it was extended in three phases to cover all of India. The following figures convey its scope: The Act's schemes provided employment to almost 55 million households and spent approximately 80 billion USD in 2010-11 alone (DoRD, 2011). The union government realized the scope of data management this programme demanded, and introduced an ambitious

nationwide digitization drive to address this challenge. Further, building on the rights-based model of the act, it located transparent and accountable information as a key driver in the success of the poverty alleviation goal. We examine this MGNREGA information infrastructure as a critical e-governance mechanism and ask the following question: What is the relationship between the MGNREGA information infrastructure's vision of transparent, accountable programme-related information, and its need to achieve scale and sustainability?

To answer to this question, we deployed ethnographic tools to study the implementation of the national MGNREGA information infrastructure, within a single district in the state of Madhya Pradesh in India. A closer look unearths what Susan Leigh Star terms as the 'drama' that are built into these infrastructures. We observed that more than one mode of MGNREGA-related information gathering procedures co-existed within this geography: There was the union government built NREGAsoft that collected data at the block level and pushed through a hierarchy of gateways to a central server located in the state capital; a grassroots innovation called EMuster rolled out by a small private developer agency; and traditional paper-based mustering tools administered by village administrators. We studied each these technical components, as 'boundary objects' i.e. 'as objects that bring together different social worlds – in this case, governance bodies, technical teams, and poverty-ridden end users.' (Star & Griesemer, 1989)

Such a formulation allows 'interpretative understanding' of this information infrastructure: we map this e-governance as a socio-technical system of development as it is implemented at the grassroots level bringing together diverse human and non-human components. Being a demand- or rights-based programme, MGNREGA's development goal of poverty eradication is deeply tied to the success of its information infrastructure to a) fully cover all MGNREGA beneficiaries, and b) to fully reflect data on works, workers, and wages. In order for a beneficiary to fully exercise her right to work,

she must be registered within the information infrastructure, her job details must be entered onto job cards, and paper-based and well as electronic muster rolls, and her wages must be processed through the electronic gateway in order to appear in her bank account.

Thus, given how deeply the information infrastructure in implicated within the government's development goal, it is imperative this tool be transparent and accountable. Additionally, it must be scalable and sustainable. We suggest that these goals are best achieved through an explicit recognition of the following: a) At the outset, The MGNREGA information infrastructure is an emergent product of everyday micro-negotiations; it must allow for such everyday problem solving. b) Programme goals of transparency and accountability are open to local interpretations based on local tools and conditions; it must be open to appropriately situated solutions. c) A global information infrastructure is built by bringing together diverse local practices; it must harness existing local data processing techniques as 'gateways' to seamless information.

The paper is organized as follows: The following sections describe our methodological and theoretical frameworks. We then outline our findings on the workings of both NREGAsoft and EMuster. Finally we discuss our analysis and offer a conclusion.

2. METHODOLOGY

Louis Bucciarelli states that 'Infrastructure...is a dense interwoven fabric that is, at the same time, dynamic, thoroughly ecological, even fragile.' (1994, p131) Our methodology focused on uncovering the dense work that builds and maintains the NREGA information infrastructure. Using qualitative techniques, we mapped 1) the everyday socio-technical work of various actors within the infrastructure, 2) how these actors interpret its goals of transparency and accountability in their daily work, and, 3) ultimately, how these situated data management techniques eventually contribute to

achieve the larger structure. E-governance tools are themselves also active agents that mediate between the diverse sets of actors and locations within its network. They contribute in shaping of identities, policies and technology choices. We use the ethnographic toolkit to capture these dispersed activities spread over multiple workplaces, and communities. The NREGAsoft codifies data at the Block level, that moves up through the district, state and ultimately to the national servers. For the purposes of this work, we focus on the codification activity within a single district in Madhya Pradesh. The study had two stages, both conducted from February 2011 to May 2011. Since the units of analysis for this study are two MGNREGA based solutions operating in the same geography, respondent selection was through purposive non-random sampling.

The first stage included studying the digital information infrastructure at its smallest unit of administrative operation: A Block, Belar, in Madhya Pradesh was selected based on it being a site where both NREGAsoft as well as EMuster were engaged. The following state officials were interviewed: Two data entry operators who work at the Block and District level respectively, two sub-engineers responsible for managing and supervising work allocation under the MGNREGA scheme, the Block Development Official responsible for the overall technical and administrative functioning of MGNREGA, two MGNREGA beneficiaries. We also conducted observations of the everyday work at four MGNREGA work site and the practices of attendance marking, and work assessment. We also conducted an ethnographically informed investigation of EMuster's testing in the same site. We observed the solution being tested as well as being demonstrated in at least two locations: the MGNREGA worksite with scheme's beneficiaries and at the data entry office with the officials responsible for administering the programme.

The second stage involved understanding EMuster as an innovation within a state information infrastructure. In order to understand the design process of this privately designed MIS, we also interviewed six software engineering professionals who built this system: This includes nine engineers and developers located at two offices of the Lateral Praxis across the organization's hierarchical structure. Since the focus was to understand both individual roles as well as group development processes, interviews were conducted separately as well as in teams as required. We also carried out observations of everyday practices within the testing and implementation teams. It must be reiterated that we also accompanied one of the testing engineers of EMuster from his desk to the field site in Madhya Pradesh on his testing and demo field trip.

In order to understand the policy perspective at its largest scale, we also interviewed two union-level officials engaged in building and managing MGNREGA programmes as well as its technical framework at the national level. We also carried out documentary analysis of materials like published or unpublished user Manuals, operational guidelines, implementation toolkits, webpages and layouts, and online and offline training modules that accompanied these information artifacts.

3. LITERATURE REVIEW

The Mahatma Gandhi National Rural Employment Guarantee Act with its promise of empowering the 'common man,' has been under close scrutiny. Jean Drèze (2009), its economic architect reports mixed results: increased beneficiary enrolment and women's participation coexist with 'rationing' of work, absence of demand-driven employment, job-cards and muster rolls irregularities. Awareness and information access holds the key.   This new demand-driven, or rights-based governance model also demands new political imagination: Mihir Shah (2008) indicates the need to involve professional input in rural management. The

Andhra Pradesh state hired the Indian global IT giant, Tata Consultancy Services (TCS) to build software to monitor what administrators called the programme's 'critical needs' (Raman & Dutta, 2007).

However, evidence from states like Orissa, the first to digitize MGNREGA data, suggests that muster irregularities flourish despite computerization (Das & Pradhan, 2007). Katyayani Dalmia (2009) in her study of various state-run MGNREGA websites attributes such glaring gaps to the state agencies' complete lack of 'orientation to the lives of local citizens.' Studying India's e-governance initiatives, Simone Cecchini and Christopher Scott state that (2003) that IT-based initiatives can help reduce poverty only if it involves actors that have a state stake in working with the poor. Lateral Praxis, the EMuster developer we study, positions itself as one such private operator that builds its own enterprise model based on filling gaps in information access to poverty alleviation programmes as a sustainable and even profitable project. This enterprise describes itself to us as a 'nimble, young, but experienced "outsider,"' that has a stake in this space as a market for its proven expertise.

This digitization-driven model must be read within the larger context of ICT for development discourse in India. Analysing whether India's position as a global leader in information technology has any direct development benefits for the average Indian citizen, Geoff Walsham (2010) suggests that the results are mixed. Both private and State-run ICTD deployments like telecentres, and health information systems have suffered from lack of funding, gaps between macro-level planning grassroots implementation, and access barriers (Kumar & Best, 2006; Noir & Walsham, 2007; Kurien 2008). Scholars like Shirin Madon (2006) indicate there remain larger institutional challenges like corruption and the need to 'develop staff capacity to work creatively in a world of uncertainty.' As Sreekumar (2007) notes in the case of the Gyandoot service centres in Madhya Pradesh, technology access must also contend with complex social power dynamics of the specific community. Cases like digitised land reforms have reduced paperwork, but are still prone to manipulation and corruption (Prakash and De, 2007). Further, the mode of information generation and dissemination remains top down. Walsham (p.14) suggests the need for models that disrupt the power dynamics already built into ICT interventions. He states that this could entail simple moves like enabling information production in the vernacular. Madon (2007) identifies four criteria for the success of ICTD interventions: They must get symbolic acceptance within the community; they must stimulate valuable social activity within the community; they must be able to attract revenue streams; and must have strong government support. Thus, ICTs, like the MGNREGA's information infrastructure, cannot be hoped to fix programmatic issues, or deliver accountability promises. They must fit within their context of a diversity of actors.

It is critical to acknowledge that these technical systems must be read within a heterogeneous network of multiple actors – where both the technological artifact and its 'context' are dynamic. Chrisanthi Avgerou (2004) suggests investigating Information Systems (IS) as institutional actors in developing countries. This does two things: first it frees the technology itself from being read as merely an instrumental toolkit for programme delivery. Second, it allows us to study the IS as a heterogeneous entity that is historically shaped, has a set of established practices and practitioners with 'technical, symbolic, and political mechanisms' (p. 47). It allows the reading of this IS in relation to other institutions, like governance, civil society, or polity. This also opens up 'black boxes' like established best practices within information systems as objects of inquiry.

At the same time, a heterogeneous approach also allows a more dynamic and sophisticated theorizing about what is considered as 'context' for a technological project. Avgerou et al. (2009) provides the example of Westrup's configuration of culture, or the technology's 'context', also as 'constantly being maintained, changing, and emergent.' Heeks (1998) offers the example of

computerized train reservations in Indian Railways that became successful only after working into the system the historical autonomy of the local stationmaster. In the context of this paper, the Employment Guarantee Act itself imagines a new kind of citizenship – for the first time, a poverty-alleviation programme is built on a rights framework (Sharma & Misra, 2008), that places very different kinds of demands on the polity, and imagines a new mode of citizenship. This also implicates itself into the design of the information infrastructure.

We use the toolkit of the 'boundary object' as a way to capture this dynamic process. An information infrastructure as a technological artifact, brings together diverse communities of practice or set of actors: citizens, state instruments, innovators to name a few. Star and Griesemer (1989) suggest that a technological artifact emerges from more than one set of translations: there are as many translations as there are communities of practice engaged or enrolled within this artifact. Any disagreement in meanings in the process of this translation are settled through 'boundary objects' – these are real or conceptual objects that are accepted as inhabiting several communities of practice and satisfying the needs of all the communities. The infrastructure studies approach suggests that given the diversity of elements that characterize it, an information infrastructure can be conceptualized as a boundary infrastructure, or a network of communities of practice bound together by boundary objects.

This conceptualisation has at least three benefits: It acknowledges information infrastructures as a constructed entity reflecting diverse values. Second, it offers the possibility that any community of practice, in our case, MGNREGA beneficiaries, the administrators, or the system designers, can enter the system, and pull out the kinds of information objects it needs. Third, it highlights the local nature of any information infrastructure. We use the boundary objects toolkit and conduct an infrastructural inversion (Bowker & Star, 1994): i.e. focus on the activities of building and maintenance

that hold the information infrastructure of the NREGA together.

We focus on the following:

1) the everyday socio-technical work that constitutes the NREGA information infrastructure;
2) the diverse interpretative practices of its goals of transparency and accountability; and
3) the significance of existing situated practices of data processing in achieving seamless information.

4. FINDINGS

A. NREGAsoft: Government expertise handles government information through government infrastructure

Values of transparency and accountability sit at the heart of the MGNREGA programme's vision of eradicating poverty. The government demonstrated these values through the instruments it deployed to fortify this legislation: Even prior to the digital solution, the government built in into the MGNREGA mechanisms of community-based public social audits through open hearings in village assemblies. Further, the Right to Information Act (RTI 2005) was passed as a companion to this Act. All village offices were directed to establish MGNREGA grievance cells, and toll free telephone numbers as mechanisms of providing the citizenship the possibility of accessing the MGNREGA machinery. Further, all muster rolls were be displayed at an accessible location within the village office – the citizen could freely access these at no fees, and without submitting any paperwork. However, these directions by themselves did not seem to suffice in actively performing the transparency and accountability goals. Information Technology would fulfil that need. On 31st December 2008 the government of India issued a notification to the Act stating that in order to ensure transparency and accountability at all levels of implementation, all information must be available in the public domain in downloadable electronic form through the NREGA website.

Both MGNREGA the act, and its government-run MIS share timelines. Both were rolled out in 3 phases. NREGAsoft was launched with MGNREGA in 2005. Phase I of 2006-07 saw them implemented in 200 most backwards districts of the country, extended to 330 districts in phase II (2007-08), and finally to the whole country in Phase III (April 2008). NIC figures suggest that at the time of writing this, NREGASoft spans across 31 states (89% coverage), 599 districts (95.5% coverage), 241,000 gram panchayats and 640,302 villages (92.5% coverage) (MoRD, 2011). The government gave the task of building this massive MIS to its own software-developing agency, the National Informatics Centre. Despite India's well-recognized abundance of private software developing strength, a union official informs us that the government decided to keep the process 'in-house'. The official attributes this decision to a mix of pragmatism and policy: The NIC had a history of working with government agencies, and so understood the unique nature of this client. The technical workforce could be physically housed within the same office space as where the NREGA was being developed. This physical proximity was considered significant in the early stages of both these artifacts. The NIC was ultimately a government entity – this meant that it would not be driven by financial considerations or constraints in its operations. Also, being the pioneer of e-governance work in India, it understood the policy and governance aspects better than a private agency would. Additionally, being a federal body that has run national programmes, it could scale quickly. After six years in operation, the technical team continues share office space with the NREGA division of union government.

The Union Government and its builders at NIC envision NREGAsoft as fulfilling a mix of governance and technical goals: facilitating e-Governance across all administrative units; empowering the common man using the information technology as a facilitator; provide information to citizen in compliance with the right to information Act; facilitate faster information exchange between the various stakeholders through the network (Sharma & Misra,

2008). Thus, it equates technical infrastructure with sound governance, with its values of efficiency and empowerment. NREGAsoft is built on a MS Windows server and requires installing IIS Web Server with ASP at the front end, and SQL 2000 Server applications for backend operations. (NIC, 2007) It has both an online and offline mode (the latter for conditions of poor or no internet connectivity). It is Unicode enabled for local languages. One of its designers described it as being based on a 'WWW' model or a Worker-Wages-Work model.

Based on the wide number of what its developers term as 'stakeholders' who will access the application for various purposes, it has been divided into seven discrete modules: Worker management, Fund management, Works management, Grievance redressal, Staffing position, Cost estimation, Knowledge network/Solution exchange, Social audit module, Bank/Post office module, and Labour budget modules (Sharma & Misra, 2008). The levels of access vary based on one's role as identified by the system. Thus a lay worker will not have access to data entry ability on her job card details. She can view these details.
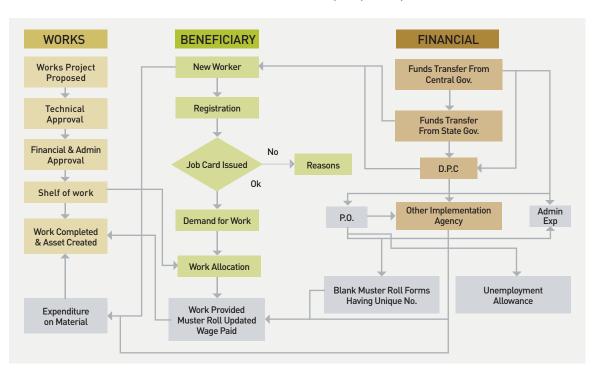
B. The last mile: opportunities and challenges

Rajore Block in the central Indian state of Madhya Pradesh, has an administration that is enthusiastic about both MGNREGA as a programme, and NREGAsoft as a new technical toolkit. Partly, this is due to the nature of its executive leadership: Here, MGNREGA's information infrastructure is nested within an administrative ecology that encourages outreach. The area's pivotal officials have had a service history of encouraging high technology in their areas. They see information and communication technologies (ICTs) as natural modes of ensuring various governance goals: The district official informs us, 'It will automatically bring transparency. People can see everything for themselves. I have seen it before in my last posting. I did it there also. Computerizing is the path of the future.'

The Block Development Officer actively believes that these office premises must be a welcoming space for every citizen. Unlike the average state office, this one has neat, well-displayed boards, a fresh coat of paint, and a well-kept garden. We noticed significant numbers of local citizens engaging with different offices on the premises. The officer tells us, 'My aim is to make this a model Block. Not just for MGNREGA. We will do it. People should be able to come to us. I keep an open door policy. Social justice is dear to me. We are conducting a state-funded wedding ceremony tomorrow for some 40 socio-economically backward couples.'

The enthusiasm and the culture of active administrating, however, do not find their expression in NREGAsoft. This despite high rates of enrolment into the MGNREGA within the Block: More than 9000 families have already been provided employment in this financial year of 2011-2012 (MoRD, 2011). In terms of its information ecology, the government report (MoRD, 2011) tells us that the Block has only two desktop comput-

ers in working condition. The headquarter town of the Block has internet connectivity, but the Block office itself does not. We observed paper-based records of all villages being collectively entered into the NREGAsoft system in the offline mode at the level of the Block by specially employed data-entry operators – three in number for this Block. On an average they enter data of anywhere between 100-150 workers per day. Each worker's data takes at least 2 minutes if the system works smoothly, and does not 'freeze'. The vision for this crucial stage of data production as ongoing work is unclear. The personnel are hired on a fixed-term contractual basis. The data they generate is transported, either in the form of DVDs or other external storage devices like pen drives, to the district data entry officer at mutually agreed up fixed intervals. The district level officer screens the data for any unchecked errors or missing entries, and finally it is taken online to vertically integrate with state and national figures. However, big and small issues pose challenges: time lag, erratic electricity, the challenge of

NREGA soft workflow (NIC, 2007)

the sheer scale of data. A single person is responsible for this task that involves substantial manual processing. We noticed that while backups sent physically from the offline operators to the online operator were updated within 24 hours, there was considerable variation in the time taken from the time the data arrives in paper form to the Block office to and its eventually appearing on the public portal for NREGAsoft. The data entry operator tells us there are a number of issues at this grassroots end. 'Simple functions like edit functions do not work. So this lady's name got wrongly entered at the registration stage. Now, I just cannot get it to edit this information. She is still reflected as a male! So one has to be very careful when entering data. Also, legacy data have a lot of mistakes, because of which our work gets stuck. Serial numbers are wrong in some places. We are trying to fix. I would have preferred that this edit could really work.' Further, there are basic issues with the system's ability to handle other media: The district data entry official provides an example: 'At present, one of the key ways of verifying worker information is through photographs. If I am the worker, and I go online to see my job card details, it should be accompanied with my photograph. That is one of the ways I know this is my information. But the online version just does not allow me to upload these worker photographs. It's a simple bug. But it doesn't work. The photo is not crucial for work or wage computation. But it is very crucial for the worker. Even if, practically speaking, his chances of going online are zero.'

The physical proximity between the block and district office (they are located within a couple of kilometres of each other in this case) is a decisive factor in the promptness with which offline data is pushed online. In case the district data entry operator finds errors in the offline version received, issues alerts to the subordinates at the Block office who fix it and then resend an updated file in physical form back to the district office. Online reports of another Block, Amrai, in the same district, located more than 50 kilometres away, show a higher

percentage of data uploads to NREGAsoft online to have occurred by a lag of at least three months. A near-permanent fixture at the worktable of the district data entry operator is a towering stack of compact discs. A parallel near-permanent fixture at the Block data office is bundles of paper-based files and musters. We suggest that this is an open challenge to NREGAsoft's ambitions of seamlessness in the information infrastructure.

C. Innovating on a 'global' database

The scenario described above, of a large potential database management task yet to be tapped efficiently, of a system that exists but is insufficient, and of administrative officials willing to engage, offered a valuable opportunity for the entry of new players. In a move to address NREGAsoft's issues, the government of India explicitly encouraged the entry of small private software engineering enterprises. This launched a series of proofs of concepts, demonstrations, and pilot testing, that would culminate in enterprises being selected through competitive bidding in each state. This process offered the government at least three opportunities: It could now tap into existing abundant software development skills in the private sector. The government IT machinery, with its limited talent pool could not hope to complete the process given the size of operations. And third, including non-government players strengthens the government claims of transparency, accountability, and ultimately democracy. This section examines one such NREGA-oriented private online information management tool called EMuster, devised by a small Indian software engineering enterprise named Lateral Praxis (LP), with offices in Mumbai and Delhi. At the time of data collection, LP was a small enterprise of 29 software professionals with the average age of 27. Everyone had worked on the EMuster project at some point. A chance association with a government project on a fertilizer subsidy tracking system opened up big and small opportunities to work on other State-

driven projects. This proved fruitful preparing ground for EMuster. LP now had an insight into the culture of government machinery, and had acquired the skills of engaging with a traditionally non-technical client like a government department. Also, most union government projects had historically been devised by the government's own NIC.

LP designers saw their direct and indirect associations as technical advantage. Says a 27 year old LP programmer, 'We have watched NIC so closely for so many years. We know how their brain...their logic, works. We know what their strengths and weaknesses are, even though they are a closed organization.' So, when working on a project like EMuster that must integrate seamlessly with an NIC product like NREGAsoft, this bank of tacit knowledge came handy. LP's leadership also developed close networks within the system, that led to identifying the NREGA project as a design opportunity for LP.

LP took up the State's call to private software developers as an opportunity to translate all these advantages into its own MGNREGA-based solution. Their years of working on job tracking solutions prepared them to experiment with technologies. As a young programmer stated, 'We can build anything on .NET even in our sleep!' They built a .NET based solution named EMuster, that aims to address what they informed us as challenges of 'inefficiency', 'inaccessibility', and 'poor data management' that the government's NREGAsoft contends with.

LP narrowed down all of NREGA's and the NREGAsoft's problems to 'human intervention' or the high potential of mishandling of the paper-based (thus presumed open to manipulation) muster. It devised its own test product, 'EMuster' as an 'end-to-end' solution that works on a series of devices, as an 'automated' instrument for the entire process. Exploratory fieldwork revealed LP and Emuster's sociotechnical universe. Unlike NREGAsoft, task-related data like registering for

jobs and marking attendance are not collected on a paper-based muster. The developer introduced a new technological interface into the system's chain: Enrolments would now be done with a biometric device connected to the EMuster web-based server. The biometric device enables registration, marks attendance (including GPS co-ordinates), calculates wages, and issues wage vouchers.

Unlike the NREGAsoft that entered data only at the Block level, all data is captured at the village level on the device that can transfer information either through GPRS in real time, or physically through storage devices to a machine on the network that is located at the village administration office, which in turn triggers updates vertically on centrally located servers. Beneficiaries can view the data through a public portal accessible at every village office or at any location that has internet access, or on the biometric device itself. Eventually, the solution aims to build into it an automated cash-remittance feature. It thus does away with the deployment of armies of data entry operators who have to translate paper-based muster rolls into electronic data. It also reduces the possibility of information error, and delays in data-entry. Finally, for an illiterate population that has a long history of relying on fingerprint impressions as valid and unique signatures, the biometric fingerprint is relatively easy to translate culturally as a valuable and non-violable guarantee of the right to work. LP addresses challenges of sluggishness and draft with 'real-time' data, minimum 'human intervention', and a broader range of information for public access, as its contribution to transparency, accountability and efficiency.

For EMuster to be considered successful it must not only capture, but 'sync,' and translate the thumb impressions with NREGAsoft. It must be expressed in a technical language that fits with the protocols of the technologies being used – in this case SQL. Simultaneously, it must be accessible to

the bottom-of-the-pyramid citizen-consumer as a window for state accountability: The system must provide real-time information. It must be trustworthy: must not break down, must not be too complex to maintain or navigate, it must be incorruptible. In all these ways, the small enterprise's solution would perform the transparency and accountability goals of governance.
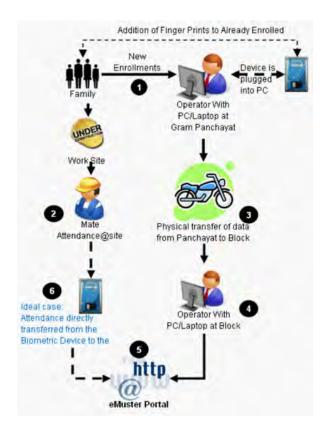
5. DISCUSSION
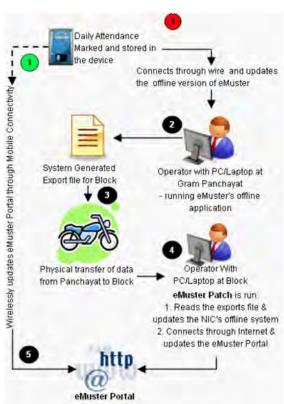
A. The invisible work that delivers transparency and accountability

The NREGA information infrastructure can be read as a case of a top down model that is systematically spreading in phases from higher levels of administration, where it is now fully operational to the lowest level of the blocks, where it is still seeing slow adoption. Its elements were designed by a centralized body (NIC), with little or no localized input: It draws its database from the 2002 Below Poverty Line (BPL) census. Its table structures are based on already existing paper-based tools like muster rolls and measurement books. However, we suggest that in order to understand the system as an actor that must become sustainable, we need to problematise this notion of it being already fully formed. In other words, examine NREGAsoft as a boundary object that traverses multiple worlds, and evokes diverse practices. We suggest that, while 'true universality is necessarily always out of reach,' (Bowker, 1999), there is a lot of everyday tinkering that allows the universal model to emerge and sustain itself in the first place.

While an ideally functioning NREGASoft would probably have delivered the transparency and

EMuster Information Flow and Data Synchronization models (Gupta et al. 2008)

accountability promises, in reality, a system of this scale and scope faces simple and complex functional and structural challenges everyday. Despite this, NREGASoft is serviced everyday at the grassroots level. In places that it trickled down to the Block level, we found that there were a lot of off-line improvisation practices that makes data-entry into NREGAsoft possible. Grassroots level data entry operators inform us that they have had to 'crack the system' in order to make it work, to deliver its promise of complete data: 'The Act states that a worker is entitled to a day of paid leave for every six days of work. But the system does not let us account for days that workers take holidays in the middle of allocated work periods that are longer than six days. I have found a way to work around that by tinkering with the work allocation system. It doubles the amount of work I have to do: I have to break up his workdays into pre- and post-holiday, and enter the separately for each chunk. But at least, now it works!' The need to represent complete data that truly reflects the worksite reality demands that the data entry operator be watchful for any such gaps in data. Further, while realtime data is still a distant goal, the attempt to at least reflect recent data includes some extra-guideline practices: The district level data entry operator tells us, 'I know data entry operators at the block level are not authorized to push data online. They have the online module installed on their machines. And it is password protected. But I have shared it with them. They should not....But my operators in faraway blocks do it anyway sometimes. I have operators as far away as 60 kilometers. I cannot ask them to travel all the way and send me each day's data. Otherwise we would lose precious time in the DVDs and pen drives going back and forth.' In a scenario where getting timely data online is the of the essence, guidelines are negotiable.

In the field, we asked the question, 'Does the information infrastructure deliver on the programme values of transparency and accountability?' Given the sheer size of the system, we found that to answer this sufficiently, we must focus not on the macro structure of the system, but on the nitty-gritty of work that makes up the infrastructure. This encounter with grassroots realities transformed our original question into 'how well does the information infrastructure deliver on its programme values of transparency and accountability (given its challenges)?' We see that fulfilling these promises involves a series of everyday practices that are intuitive or learned informally, individual or shared, but that are certainly hidden from the narratives of the data that appear on screen.

At any rate, the infrastructure and its information both emerge not out of simple transcription of data from one form to another, but these translations and transactions at the grassroots. In its present configuration, the MGNREGA information infrastructure has no place for such situated problem solving. We suggest that such innovations need to be accounted for. Two ways of achieving that is by building more flexibility into the system, and engaging with grassroots, fragmented practices.

B. Multiple translations of the transparency and accountability visions:

We also find that different actors understand transparency and accountability differently, even within the technical domain. The success of NREGA's vision of poverty eradication through work rights is deeply tied to the efficiency promises of its MIS, the NREGAsoft. As mentioned, the Act explicitly rests on stated visions of transparency and accountability. NREGAsoft translated these two values as digitization.

Now, digitization, coterminous with system-enabled efficiency, delivered to the MGNREGA beneficiary transparent and accountable governance in two ways: Proactive disclosure, which includes the public access of data on the NREGAsoft website; and regular social audit that would be based on data available freely at the village panchayat in paper and digital format. Eventually, when the government incorporated biometrics as a tool in this information infrastructure, the State

clearly stated that its objective with this tool was 'people's empowerment.' (MoRD, 2008) Thus, seamless and successful technology was by itself, a guarantor of good governance – in this case a transparent and accountable NREGA.

This guarantee is predicated on all MGNREGA information being available digitally, with ease. At the 'global' level (i.e. the national database), the following mechanisms would ensure efficiency (ibid., p. 82): A large body of MIS operators – government figures estimate that the system will ultimately need at least 12,000 operators nationwide for its 5000 blocks; A complete 'bare minimum database' with fixed data, like village names and job-card holder names, that are assumed to be 'non-volatile'; Version control on software and a stable architecture that does not allow any unsanctioned modification. Making data visible through a government-hosted portal lends the data legitimacy. It also fixes accountability. Any delays in payment can be petitioned based on the works data reflected on the portal.

Accountability is also sought to be fixed at the micro-level: The guideline demands that 'there should be a system of authentication of data to clearly identify the person who prepares and scrutinizes the data.' (ibid. p. 84) Thus, accountability is demonstrated both at the institutional and personnel level – a marked move from the invisible dehumanized 'administrative machinery' that cannot be accessed by the average citizen. But all such acts of enforcing accountability and transparency, is contingent upon and entirely mediated by, the digitized information system. The success of MGNREGA as a social security programme is dependent on the NREGAsoft's ability to run efficiently (at which point it is assumed to be transparent and accountable). We have already discussed the challenges of this formulation, given its complexity.

Grassroots innovators also problematize this translation of transparency, accountability and efficiency as just digitization. EMuster developers unpack these values to mean not digitization but 'real time data,' and 'access.' A development team member states, 'First, what use is data in a computer somewhere far away from my home if I cannot reach it? Second, what use is 3-6 months old data? I cannot use it for complaint redressal. (The worker) cannot complain for delayed payments if the data of work itself is delayed! To be accountable, you should first be able to count in real time!' EMuster operationalized this gap with yet another technical solution: The biometric device would plug the efficiency, and by implication, transparency and accountability, gaps. It is accessible by the sheer fact of its presence everyday at the job site for marking daily attendance. It is voice-enabled – so it can provide the worker with any updates based on real time data. Being based on fingerprint activation, it not only does the mechanical task of protecting data, it also draws on the community's historical privileging of fingerprint as a valuable personal indicator.

Thus both these artifacts within the MGNREGA information infrastructure understand the statutory goals of efficiency, transparency and accountability differently. And each resolves it through a different technical solution. Sustainability and scale will entail finding ways to engage such diverse grassroots practices. One way to do that is to harness existing diverse practices as meaningful resources in data collection.

C. A global information infrastructure as network of local translations

While true universality is a moving target, the MGNREGA information infrastructure has the urgent need to scale and integrate a vast body of diverse users. Further, it faces resource challenges of low internet penetration, lack of trained personnel, diversity of phases of implementation, and diverging user skills and relationships with technology. These conditions challenge the ability of the MGNREGA information infrastructure to deliver on its transparency and accountability promise in a single pan-India fashion. We suggest that one way to achieve this goal is to translate the already existing grassroots practices into 'gateways' (Braa et al, 2007) of

information flow.

The government of India states that a key component of the NREGA poverty alleviation programme is the vision of collective and collaborative ownership of rights and obligations. This vision could be extended to collective and collaborative rights and obligations towards programme-related information as well. The diversity of practices we described above indicates that the MGNREGA information infrastructure is an emergent entity that brings together multiple communities of practice. The key to its scaling and sustainability ambitions lies in capturing and institutionalizing these diverse practices.

Drawing on Braa et al (2007), we suggest that building and harnessing information gateways will make this possible: First, it must be remembered that while a truly national digital information infrastructure remains the vision for the long duree, truly national data standards and information processing procedures are more critical to fulfill the transparency and accountability goals. This implies decentering the need for having technical standardization and focusing on achieving information standardization. Historically, the MGNREGA information infrastructure sits on translations through a series of electronic and non-electronic 'gateways' or interfaces from the grassroots to the national level. Its' information corpus is a result of translations of work measured and articulated onto worker job cards, engineer's measurement books, paper based and ultimately electronic muster rolls. Innovations like EMuster bring the additional dimension of new interventions like biometric devices.

It is crucial that MGNREGA information infrastructure is able to account for, and gain from, the role these heterogeneous gateways play in programme delivery. This implies that MGNREGA information infrastructure must not simply become a substitution of one set of non-electronic tools with electronic ones. The electronic muster rolls need not simply mimic the paper based ones. There are two possibilities here: first, existing non-electronic tools need not be simply discarded. Since they already occupy positions of power within the user community, they can become a rich site to bring about small, new changes that will prepare the community for a more fruitful relationship with the electronic information infrastructure.

Historically, government-citizen transaction has relied on paperwork. Any piece of paper generated from a government authority is precious for the poorest of the poor in India. It is the government made tangible. As described in the opening vignette, the laborer Pramila, safely tucks away the paper stub generated by the biometric device. As the grassroots administrator informs us, 'we have somehow matured from people collecting their MGNREGA wages in the form of cash with paper-based vouchers to receiving them by bank transfers. It took us a lot of work...4 years...to explain that it is still their money, and that they did not need to have paper-based bank passbooks.' Further, everyday work at a jobsite can pose its own complexities. Prakash, a 43 year old MGNREGA beneficiary demonstrated this for us, 'What if I take half the day off because of an emergency? Will it still count me as absent or present? Or half day?' Such apprehensions are best addressed through demonstrations on existing systems of information, that can then transition onto the e-governance mechanisms. The lack of access to NREGAsoft must not form a barrier to the MGNREGA beneficiary to her right to accountable, transparent information.

Secondly, at the same time, situated innovation practices, can also serve not just as 'small test pieces,' but critical gateways for strengthening key aspects of the MGNREGA information infrastructure. Emuster's biometric device, and associated portal offers the possibility of drastically reducing process time, and extension of MGNREGA data access from the current Block level to the village panchayat level. However, engaging the government developer, NIC's, interest in these tools was a challenge. A design team member at Lateral Praxis states, 'NIC is not popular for its communication skills

(states ironically). There is limited access to developer manuals or anything. We had no insight into their logic, other than by our own homework. So we actually have a person whose job is to just watch the NREGAsoft portal for changes on a daily basis. And then we try and work backwards....' Thus, there is no mode of channelling the gains of situated innovation of the likes of EMuster towards NREGAsoft's scale goals.

A singular, top down, national level implementation plan has inbuilt barriers especially in a diverse country like India. As Braa et al (2007) mention, it is instructive to imagine that 'there will always be technically incompatible subsystems' (399). However, it is important to remember that the objective is to achieve seamless data flow oriented towards the governance goal of transparent and accountable information. And existing gateways (however, diverse) with their 'installed base' of resources (Hanseth, 2002) help achieve this standardization through their translation mechanisms. Sustainable data flows do not require the imposition of one global information system, but a network of situated, effective systems. In other words, it needs boundary infrastructures that can mediate between local conditions and global goals of transparency and accountability.

6. CONCLUSION

A dynamic view of information infrastructure would describe the NREGA artifact as a technology that enables 'informatizing,'(Zuboff, 1988), that can be deployed in many ways. EMuster or NREGAsoft deployments produce (however disputed) efficiency in MGNREGA programme delivery. Simultaneously, they also produce data, that can be deployed by the programme beneficiaries to enforce accountability and transparency. The MGNREGA information infrastructure is a network of socially embedded boundary objects like, State-led solutions like NREGAsoft, privately innovations like EMuster, paper-based muster rolls, and biometric

devices and readings thereof, each of which acquire a different meaning in different communities of practice. This information infrastructure also reflects a culture in transformation. The government for the first time, critically ties its governance and development goals to information. And the rights based model empowers the poorest of the poor to directly access government machinery through these information systems. MGNREGA, the Act is envisioned as a collaborative process being monitored both by the empowered citizen, as well as an alert state. Its information infrastructure is envisaged as the site for enacting this collaboration.

We drew on ethnographically informed data to examine the functionings of this information infrastructure as a deliverer of the state goals of transparent and accountable data on the MGNREGA programme. We found that given the scale and scope of the technological artifact, the question to ask was not whether it fulfils the programme promise of transparency and accountability, but how well it manages to do so, and what are the opportunities to improve it? Given how deeply the success of the programme is tied to its information infrastructure, we speculated on the conditions that could shape its scaling and sustainability. We suggested that first, universality is a shifting goal: the solution be considered as a product of everyday problem solving, that makes sure that the larger solution 'works.'

It is important that there be space for such situated 'tinkering,' since they contribute to sustained information flow. Second, we suggested that MGNREGA's programme goals of transparency and accountability can be found in more than one form, based on local conditions and tools. The information infrastructure will gain from recognizing and incorporating such appropriately situated expressions. Lastly, we suggest that larger programme goals of seamless data can be achieved more efficiently and simply by incorporating successful existing modes of information processing as gateways, rather than waiting to achieve global technical seamlessness.

Star and Bowker (1999) suggest that an information infrastructure can be read in one of two ways: as a monolithic, totalizing organism that has no space for diversity of practices. Or as a network of negotiated interests or boundary objects, that is open to incorporating and acknowledging situated practices as modes to achieve seamless information integration. We suggest reading the MGNREGA information infrastructure as a case of such a 'boundary infrastructure.' (Star & Bowker, 1999, p. 131). This information system is unique: it has emerged as the single most powerful mechanism of exercising right-to-work; it must serve a very diverse population of more than 750 million; and it must operate in highly 'resource-constrained' environments. It is imperative therefore that this system be stable, sustainable, and highly adaptive.

E-governance tools in developing countries face the danger of becoming modes of exercising power over citizens. This work contributes to the body of work that examines this fraught relationship. The MGNREGA information infrastructure, at this point can either degenerate into a case of bureaucratic data-gathering, or it can be reframed as a dynamic information processing agent that successfully captures its users' diversity, provides them an arena to exercise their rights, and delivers on its promise of transparent and accountable information. We intend in further research, to shift our attention from the organization of the infrastructure to the protagonist of this Act – the rights-bearing worker-citizen, and examine what meaning this information artifact occupies in her life, and whether it fulfils its mandate to her. END

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UNDERSTANDING BROADBAND ADOPTION IN SOUTH AFRICAN HOUSEHOLDS

by Lisa Seymour, South Africa

Broadband infrastructure is a key component of the knowledge economy. Countries around the world have nominated broadband networks as crucial infrastructure for their social, economic and scientific goals. Broadband has the ability to improve the lives of citizens as it can help the youth with ICT skills for employment and improve the way they have access to education. It can help consumers obtain better work/life balance attributed to more empowerment, more productivity and less stress.

South Africa has recognized the importance of high-speed broadband technology to advance the communications infrastructure of the country. However, although the demand for broadband is quite high, it is seen that the adoption of the technology is lower than anticipated and this particularly within the households of consumers. South Africa has fallen behind international peers in both the developed and some developing markets in the race to rollout broadband services. While various studies and models aim to explain the adoption of broadband services in several countries, very few focus on the African continent. Another prominent concern is that most of the literature available focuses on the factors which may influence intention to adopt a particular service but very few comprehensively explain the actual adoption process. This research attempts to investigate the adoption of services from a holistic point of view encompassing the factors influencing the adoption of broadband. This study explores the broadband developments in South Africa and discusses the challenges faced in increasing the broadband penetration rate within the country.

The research begins with an initial literature review, followed by a qualitative study which is finally validated by a quantitative study. The initial literature review aimed to develop a generic broadband adoption model. The qualitative study aimed to inductively through interview analysis propose a model for South Africa. Finally, the quantitative study aimed to validate the proposed South African model.

The study found that with regards to consumer attitude towards broadband, technological comfort had a significant influence on broadband adoption while their entertainment perceptions had a "somewhat" significant influence. With regards to perceived behavioural control factors, lack of skills, high costs and no access to PC were found to be inhibitors of broadband adoption. This research adds to the existing literature on broadband diffusion in South Africa by proposing a model of relevant adoption factors. From a practical viewpoint this research provided a comprehensive analysis into the factors leading to the adoption of broadband in residential households that may be beneficial to various stakeholders such as government, Internet Service Providers (ISP), business consumers, public organisations, allowing them to make better informed marketing and policy decisions.

Keywords:

Broadband Internet, South Africa, Fixed Broadband, Mobile Broadband, Penetration Rates, Demand Side, Broadband Diffusion, Regulations, Policies

1. INTRODUCTION

South Africa, as an emerging market, is besieged with vast opportunities within the telecommunications sector. However, from a practical perspective, while the industry has seen much technological advancement, it has been undermined by low internet penetration rates, which in 2010 stood at 10% (InternetWorldStats, 2010). The South African government has stated that the Information and Communication Technologies (ICT) industry is key to the country's development; however, regula-

tions and policies have not always supported this stance (Francis, 2010). Moreover, once regarded as a telecommunication powerhouse, South Africa is slowly losing ground to its African counterparts such as Botswana, Zambia and Kenya due to stagnant inland infrastructure developments (Balancing-Act, 2010).

While the demand for broadband is quite high, it is seen that the adoption of the technology is lower than anticipated and this particularly within the households of consumers (MyBroadband, 2010b). Broadband adoption within the country in 2010 stood at a mere 1.4% when taking into account fixed wired connections and 7.7% for mobile wireless connections. These figures are multiple times lower than the OECD countries average of 'households with broadband access' percentage at 57.8% (MyBroadband, 2009; MyBroadband, 2010b). From an academic perspective, while various studies and models aim to explain the adoption of broadband services in several countries, very few focus on the African continent, particularly with regards to emerging economies. This research investigates the adoption of broadband services in South Africa as there is no appreciable amount of research or literature available in this regard.

Another prominent concern is that most of the literature available focuses on the factors which may influence intention to adopt a particular service but very few comprehensively explain the actual adoption process. Therefore, this research attempts to investigate the adoption of broadband services from a holistic point of view encompassing the factors influencing the adoption of broadband. In addition, the research also attempts to unpack reasons for the low broadband penetration rates which may assist government policy makers in increasing broadband adoption within the country.

The research started with an initial literature review, followed by a qualitative study which is finally validated by a quantitative study. The initial literature review aimed to develop a generic model for broadband adoption.

2. LITERATURE REVIEW

Broadband is widely used as shorthand for high-speed Internet access (Sacks, 2002; Kim, Kelly and Raja, 2010). Broadband can also be defined in terms of the technology used, in terms of the transmission capacity provided, or in terms of the functionality enabled (Sacks, 2002; Kim et al., 2010). Compared to traditional narrowband connections, broadband access is immediate. Large volumes of data can be instantly transmitted, waiting times are reduced and efficiency for users is improved. In contrast narrowband connections are slow – it is estimated that one third of user time online is spent waiting (Spurge & Roberts, 2005). For the purpose of this research broadband is regarded as those technologies that offer speeds of 256Kbps or more as defined by the South African Department of Communications (MyBroadband, 2010a). Broadband technologies are able to provide a mix of data, voice, and video services over one "pipe". Some advantages include faster access to the internet, 'always on' and making calls while surfing the Internet. Disadvantages include security threats, higher service fees than dial-up and lack of availability in rural areas.

2.1 Broadband Technologies

Broadband technologies are divided into fixed line technologies, fixed wireless technologies and wireless mobile technologies (Corning, 2005). Fixed line technologies include digital subscriber lines (DSL), cable modems, broadband over powerlines (BPL) and fibre optics such as fibre to the home (FTTH). Fixed wireless technologies include satellite, wireless fidelity (Wi-Fi) and worldwide interoperability for microwave access (WiMAX). Wireless mobile technologies include 3G and its evolutionary paths 3.5G, high speed data packet access (HSDPA), high speed packet access plus (HSPA+) and 4G or long term evolution (LTE). ADSL is the most popular of the fixed line technologies while Wi-Fi and 3G/HSDPA are the most popular of the fixed

wireless and mobile wireless technologies respectively (Corning, 2005).

2.2 Impact of Broadband

The economies of the world today are information and knowledge driven. Value creation depends on the ability to efficiently and effectively manage raw data in order to transform it into valuable knowledge and then profitably exploit that knowledge; hence many refer to broadband as the infrastructure of the knowledge economy (Sacks, 2002; KPMG, 2004; KPMG, 2005).

Broadband is an enabling technology. It allows businesses that are willing to embrace Internet business solutions to transform business processes and realize significant returns on investment. It offers consumers new opportunities to work or learn more productively (at their desks or from home), publish multimedia, switch from viewers of entertainment to participants, and – most importantly – dramatically expand their communication possibilities (US Department of Commerce, 2003).

Broadband services are underpinning the development of e-commerce, and access to bandwidth at globally competitive prices is an increasingly important determinant of competitiveness in the global knowledge economy. Policies that encourage the provision of affordable broadband access to a nation's firms can put them ahead of global competitors. Benefits of broadband include important contributions to the quality of life, in terms of education, health services and social inclusion (Sacks, 2002; US Department of Commerce, 2003). It is evident that broadband is an important focus of public policy and is likely to be a significant part of economies in the future.

2.3 Availability and Uptake of Broadband in South Africa

The most advanced country in terms of broadband penetration is South Korea (Ovum, 2009; Bernabé, 2010). Factors that contributed to this include in-

frastructure competition from a supply side and high demand from the demand side (Akamai, 2010). Low broadband penetration in developing countries has been as a result of limited fixed line infrastructures, high costs of international bandwidth and monopolies held by telecommunication companies (Goldstuck, 2010; Kim et al., 2010). In South Africa the top broadband players include semi-privatised and state owned Telkom for fixed lines, iBurst for fixed wireless, the first, second and third largest mobile operators Vodacom, MTN and Cell C respectively for mobile wireless. The price of broadband dropped significantly in a 3 year span from 2006 to 2009 mostly due to the introduction of the new SEACOM and WACS cables bringing in more international bandwidth to the country (Goldstuck, 2010). Compared to international standards, these prices are still exceptionally high and not affordable by many consumers. South Africa was placed 103rd (MyBroadband, 2011) in the world in broadband speed rankings taking into consideration the cost to speed ratio.

2.4 Proposed Model for Broadband Adoption in Households of South Africa

Various technology adoptions related theories and models including TAM (Malhotra & Galletta, 1999), TBP (Ajzen, 1991), DTPB (Taylor & Todd, 1995), DI (Rogers, 1995), MATH (Venkatesh and Brown, 2001) and UD (Shih and Venkatesh, 2004) are used to explain the development of the proposed broadband model. Integrating the constructs across all models resulted in providing the most appropriate way to understanding the research problem as none of the models could examine broadband adoption coherently. The result of this was Choudrie and Dwivedi's (2004a) Model for Broadband Diffusion which postulates that a consumer's intention to adopt broadband at home is determined by Attitude towards behaviour, Subjective Norms and Perceived Behavioural Control. Using their model for broadband diffusion and combining this with literature a generic model was formulated and proposed. For attitudinal factors new constructs security,

technology comfort and broadband content were added. Declining costs and rapid changing factors were not in Choudrie and Dwivedi's (2004a) model. However, in South Africa while prices seem to be decreasing these may still be too high for the average consumer. Therefore high cost, declining cost, knowledge, skill and needs (rapid changing factors) of a particular technology are included. Finally, after the mapping of these constructs the generic model for Broadband adoption was proposed.

3. RESEARCH QUESTION AND APPROACH

This study attempts to answer the following question: *What factors affect a South African consumer's decision to adopt broadband?*

The overall research study makes use of multiple philosophies i.e. an interpretative and a positivist philosophy. Each philosophy when used independently in research has its advantages as well as its disadvantages. Therefore in order to attain accurate findings in any study it becomes necessary to rid the study of the disadvantages inherent in a particular philosophy (Lee, 1991). However using the advantages of one particular philosophy may not be enough. Lee (1991), who developed a framework that integrates both positivist and interpretive approaches, points out that it is possible that both positivist and interpretive research approaches can co-exist separately. Therefore taking into consideration Lee's (1991) framework this study first makes use of an interpretative philosophy followed by a positivist philosophy then integrating them to ensure. that the benefits of each study are realised. The qualitative study attempted to expand and enhance the proposed model, provided by the initial literature review, through interviews. More precisely, semi structured individual interviews were carried out to identify the process of adoption. The data analysis compiles the data collected into patterns and themes and structures the data into a framework. The findings from the qualita-

tive study were then compared to the literature review. Here additional factors were added to the proposed model thereby creating a model distinctly for South Africa. Using the input from the interviews conducted, hypotheses and a questionnaire were developed. The next step aimed at validating the model through the use of the developed questionnaire. Participants in South Africa were sent questionnaires and the data obtained were analysed quantitatively using statistical techniques. Relationships between the different variables within the model were tested to confirm the model of broadband diffusion in households of South Africa. While the qualitative study preceded the quantitative study the results will be discussed together in this paper.

4. QUALITATIVE STUDY AND SAMPLE

The research time frame was cross-sectional. A purposive sampling method was used with selection criteria developed with the research questions in mind. Interviews were conducted with 16 respondents, six adopters who were also users (C1-6), one user (U1) and nine non-adopters (N1-9) (Table 1). All respondents had formal education ranging from university degrees to college diplomas. Most of these formal educations made way for their occupational roles. Occupational roles within the IT industry ranged from being lecturers of IT, systems architects and software developers to students in IT. Therefore, in this context, the respondents were given the title either IT or non-IT depending on their occupational classification. The respondents who were in the high and medium income brackets had professional occupations while those in the lower income bracket were university students or casual workers in retail. The study followed an inductive approach to analyse the data collected resulting in categories. Constant comparative analysis was performed to ensure coherence. To ensure that the data collected was reliable and valid, a triangulation of interviews was

performed with audio tapes and notes taken, a triangulation of interviews with one another and use of audit trails of documentation. The qualitative study also provided a general idea of whether the issues are comparable to those experienced in other countries and provided an indication of the expected relationship between variables. Some factors correlated with those identified in the literature survey and some additional new factors/constructs were discovered (Figure 1). In the case of a consumers attitudinal belief these factors included relative advantage, hedonic outcomes, utilitarian outcomes, security and technology comfort and the new factor loyalty. The factor inherent in subjective norms was social influence. The factors of PBC included cost, requisite knowledge, broadband content, needs and skills and new factors that have emerged included infrastructure and personal computers (PC).

5. QUANTITATIVE STUDY

The subsequent quantitative study was cross-sectional in that it analysed responses at a single point in time in 2009. While past as well as future behaviour and attitudes are of interest, it is believed that the experience of change over time could be relayed by the respondents.

Based on the model derived from both the literature review and qualitative study, the following research hypotheses were proposed:

H1: There will be demographic differences between adopters and non-adopters of broadband
H1a: Adopters of broadband will have a younger age distribution than non-adopters.
H1b: Adopters of broadband will have a higher annual household income than non-adopters.
H1c: Adopters of broadband will have higher education levels than non-adopters.
H1d: Adopters of broadband will belong to a higher occupation category than non-adopters.

Table 01: Demographics of individual respondents

ID	AGE GROUP	DISPOSABLE INCOME	FORMAL EDUCATION	OCCUPATION	IT RELATED	ACCESS
C1	50+	R20,000 R30.000	B. Proc LLB	Magistrate	Non-IT	4Mb ADSL
C2	18-30	R5.000 R10.000	Masters Degree	Student	IT	384Kb 3G
C3	31-40	R30.000+	Honours	Systems Architect	IT	1 Mb IBurst
C4	50+	R20,000 R30,000	Masters Degree	Lecturer	IT	4Mb ADSL
C5	18-30	R5.000 R10.000	Diploma in IT	Sales Assistant	Non-IT	384Kb ADSL
C6	50+	R10.000- R20.000	PhD	Lecturer	IT	384Kb ADSL
U1	18-30	← R5000	B.Bus. Sci.	Postgraduate Student	Non-IT	4Mb ADSL
N1	18-30	5000-10000	Masters	PHD Student	Non-IT	Home dial-up
N2	18-30	5000-10000	Masters	PHD Student	Non-IT	Home Dial-up
N3	18-30	←5000	Honours	Masters Student	IT	None
N4	31-40	5000-10000	Technikon	Proprietor	Non-IT	None
N5	18-30	10001-20000	Diploma	Software Developer	IT	Home Dial-up
N6	41-50	20001-30000	PhD	Assoc. Professor	IT	Home Dialup/ Work LAN
N7	18-30	10001-20000	Masters	Lecturer	IT	Work LAN
N8	18-30	20001-30000	Honours	Equity Derivatives Broker	Non-IT	None
N9	31-40	20001-30000	PhD	Lecturer	IT	Dialup/Work

H2: Overall demographics influence a consumer's Perceived Behavioural Control

H2a: The older the consumer, the higher the skills in using broadband.

H2b: The higher the level of the consumer's education, the higher the consumer's skills in using broadband.

H2c: The higher the level of the consumer's occupation, the higher the consumer's skills in using broadband,

H2d: The higher the level of the consumer's occupation, the greater the consumer's knowledge about broadband.

H2e: The higher a consumer's monthly income, the more affordable broadband will be for the consumer.

H3: Overall attitudinal factors positively influence the adoption of broadband

H3a: The greater the perceived relative advantage of using broadband over dial-up, the more likely that broadband will be adopted in the household.

H3b: The greater the perceived entertainment (hedonic outcomes) potential of using broadband, the more likely that broadband will be adopted in the household.

H3c: The greater the perceived usage (utilitarian outcomes) of Broadband for household activities the more likely its adoption.

H3d: The greater the perceived security of broadband the more likely it will be adopted.

H3e: The greater the technology comfort provided by broadband the more likely its adoption.

H3f: The greater the consumer loyalty to a particular service provider the more likely broadband is adopted.

H4: Overall PBC factors will have an influence on the consumer's intention to adopt broadband

H4a: A lack of knowledge on broadband, its availability and benefits will inhibit broadband adoption.

H4b: A lack of skills in using the PC and the Internet will inhibit broadband adoption.

H4c: A lack of perceived need for broadband will inhibit broadband adoption.

H4d: The greater the monthly cost of broadband access, the less likely that it will be adopted.

H4e: A perceived lack of broadband content will inhibit broadband adoption.

H4f: A lack of infrastructure will inhibit broadband adoption.

H4g: The lack of owning a PC or the greater the perceived cost of upgrading the old PC or buying a new PC,

the less likely that broadband will be adopted.

H5: Overall subjective norms will have a positive influence on the consumer's intention to adopt broadband

H5a: The greater the social influence by family, friends and colleagues the more likely that broadband will be adopted.

Survey questionnaires were deemed suitable as they allow objective data to be collected from a large sample in a standardised way. A pilot questionnaire was devised to "iron out" any difficulties that respondents faced when completing the questionnaire and was sent to 20 respondents who have experience in research studies. A stratified random sample was used to look at distinct sub groups based on age, occupation and income of adopters and non-adopters. The demographics of the respondents are shown in Table 2.

5.1 Broadband Adoption

Out of the 177 respondents surveyed, 155 had Internet access at home and 22 respondents had not subscribed to the technology. Among the 155 that had Internet access at home, only one respondent had a dialup connection while the rest had a broadband connection. Therefore, 154 respondents had adopted a broadband technology which represents 87% of the total sample population. Broadband with ADSL and Mobile 3G/HSDPA appeared to be the preferred technology of choice. Most respondents had more than 1 type of broadband technology in the household (Table 2). Figure 2 illustrates the number of respondents Broadband Adoption have subscribed to broadband. It represents the technologies that consumers use to access their broadband subscription. Table 3 presents the means and standard deviations of aggregate measures for the quantitative analysis of the adoption factors. Respondents
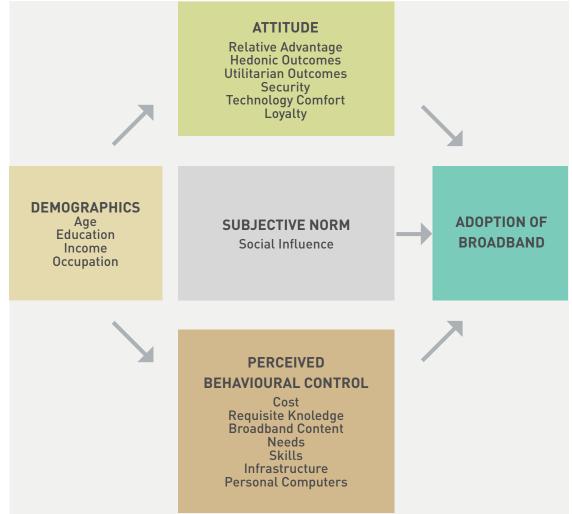
showed a strong agreement for technology comfort, IT skills and relative advantage with aggregate scores greater than 6.5.The majority of the constructs such as utilitarian outcomes, needs, requisite knowledge, infrastructure, broadband content and hedonic outcomes, showed a medium to strong agreement with aggregate scores between 5.5 and 6.5. A weak agreement (between 4.5 and 5.5) with high variance was obtained for cost and security. Respondents appeared to be neutral with

regards to the PC and loyalty with aggregate scores between ranging 4.0 and 4.5. Respondents showed a weak disagreement with subjective norms with a mean score of 3.20 and a standard deviation of 2.1 which shows a high variance in responses.

6. DISCUSSION OF FACTORS INFLUENCING ADOPTION

Qualitatively analysing the data acquired, the

Figure 01: **Proposed model for broadband adoption in South African households**

researcher attempted to expand and enhance the proposed model of broadband use and impact in the household. The responses of each consumer was analysed which determined the factors within each phase of the model. The results discussed are supported by occasional interview quotes.

6.1 Demographic factors

Data showed that the demographic variables mostly affected factors within perceived behavioural control. It appears that age and education affects the skill levels of the respondents as two respondents point out: "I had an interest in it before high school. This was probably since primary school days. I enjoyed working with computers. The more you want to experiment the more you got to understand how they work" (N7). "I think in the context of South Africa you need to educate the kids from the primary school level on how to use the computer. Just the basic things like word processing, Excel, how to use the internet, how to look up information and things like that. Children need a basic understanding of that" (C3). Occupation also affects skills as well as requisite knowledge of broadband technologies as one respondent; in particular, who works in an IT environment had higher skills and was more knowledgeable about broadband technologies:

"Besides being aware of it I'm actually working in the environment as well...it is part of my work. Before most companies have started out like Syntech and some other places I've always been in touch and before they released a product I've found out about it "(C2).

Finally, income appeared to affect the type of broadband services that a respondent subscribes to, which is related to the cost of the service as two respondents, who are in a higher and lower income bracket respectively, highlights: "Yes. I have an ADSL line. It is the fastest line. I think it is 4Mb and I have a

3GB cap" (C4). "I just have the normal ADSL 384Kbps line. I think it is the slowest" (C5).

6.2 Attitude

For consumers' attitudinal belief, factors identified in the interviews included relative advantage, hedonic outcomes, utilitarian outcomes, security, technology comfort and the new factor loyalty. Respondents believed that broadband offered numerous advantages especially over their previous dial-up connections. One respondent felt that it offered advantages from faster and always on connections to freeing up the telephone line:

"The speed is an advantage. I have access to it 24/7/365. I can use the telephone at the same time. It is much cheaper than ordinary calls or cell phone calls. I feel the previous connection was too clumsy, slow and limited access." (C6). Most respondents expressed that they gain hedonic pleasure from the consumption or use of broadband internet. One respondent in particular expressed that the ability to social network, stream audio and video and video conference made broadband more attractive: ""Mostly because of my social network the whole MXIT chat rooms actually enticed me to get 3G. I started using it to get updates on sports scores and now I can watch live clips of sports. I can also make video conference calls" (C2).

Respondents emphasised that broadband allowed them the possibility to undertake office work at home, spend more time at home with the family, look for information or product search and purchases. Two respondents mentioned that broadband allowed them to enjoy the flexibility of work hours:

"It means that I am more flexible and enjoy the flexibility that my work hours allow me. I can work either here or at home. That is my sole use for it" (C4). "Broadband made it easier for my wife. She can now do the studies at home instead of being at the hospital. Which means she is more at home and less time at the hospital and more time with the kids...I use it a lot for my studies, online banking, online shopping as well for

groceries" (C3). Consumers who felt broadband was secure expressed that the security is watched by the ISP and ISPs could track any hacking being done. They also mentioned that it is much easier to control family content in terms of what can be available to the family: "I believe that everything is routed better and watched from by the ISP. There is more tracking and less hacking. I feel that is easier to define family content. It is very handy as you can set what type of information can be shown at any time" (C6).

Most respondents expressed that they are comfortable using their broadband technology. This was due to their broadband subscription being easy to setup, user friendly and easy to learn. One respondent in particular felt that with mobile broadband, it is a "plug and go" situation: "I think that the previous dial-up connection just gave a bit of a bad experience. But it is easier now because you just plug the modem in and you go" (C3). The loyalty factor is deemed important as those with already existing connections to the internet may upgrade to faster broadband connections based on their loyalty to their ISP. "When I upgraded from my dial-up connection to broadband I kept my existing ISP, which is MWeb, I think because I am loyal to MWeb" (C6).

6.3 Subjective Norms

The factor inherent in subjective norms was social influence. Many of the respondents expressed that social influence was one of the key factors that influenced their decision to adopt broadband technology. One respondent in particular was influenced by significant others:

"My son knows a lot about these technologies. I trust that he makes the right decisions on technology and I pay for the service based on his decisions" (C1).

6.4 Perceived Behavioural Control

Perceived behavioural control is the individual's perception of their ability to perform a given behaviour. It is the beliefs of having the necessary resources and op-
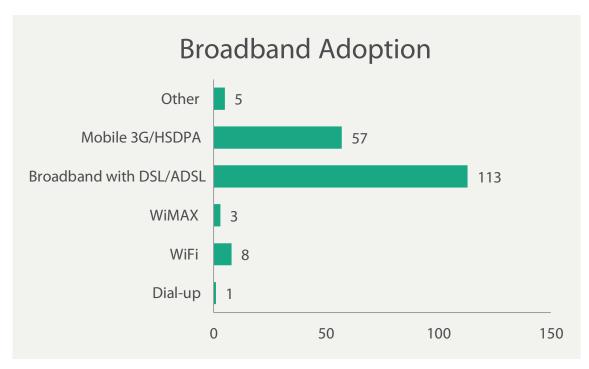
Figure O2: **Adoption of Broadband Technologies**

Table O2: **Profile of survey respondents**

	CATEGORIES	FREQUENCY	PERCENTAGE
Age	18-25	75	42.4%
	26-30	55	31.1%
	31 +	47	26.5%
	Total	**177**	**100.0%**
Education	Matric Ex./High School Diploma	67	38%
	Degree/Technikon Diploma	44	25%
	Honours Degree (Postgraduate)	53	30%
	Masters and PhD (Postgraduate research)	13	7%
	Total	**177**	**100.0%**
Occupation	Legislators, Senior Officials, Directors, Managers & Owner Managers	13	7.3%
	Professionals	61	34.5%
	Technicians & Associate Professionals	77	43.5%
	Clerks & Administrative Workers, Service & Sales Workers, Skilled Agricultural & Fishery Workers, Skilled Workers, Craft & Related Trades, Plant & Machine Operators & Assemblers, Labourers & Elementary Occupations	26	14.7%
	Total	**177**	**100.0%**
Income	← R5000	50	28.2%
	R5000 - R10 000	43	24.4%
	R10 001 -R20 000	50	28.2%
	R20 001 +	34	19.2%
	Total	**177**	**100.0%**
Internet Access as Home	Yes	155	87.6%
	No	22	12.4%
	Total	**177**	**100.00%**
Type of Internet Access at Home	Dial-up	1	0.6%
	WiFi	8	4.5%
	WiMAX	3	1.7%
	Broadband with DSL/ADSL	113	63.8%
	Mobile 3G/HSDPA	57	32.2%
	Other	5	2.8%
	Total	**187**	**105.7%**

Table 3: **Summary of Descriptive Statistics for Broadband Adoption (Items were scaled from 1 being strongly disagree to 7 being strongly agree)**

	CONSTRUCT/ITEMS	NI	N	DESCRIPTIVE	
				Mean	SD
1	Technology Comfort	3	177	6.7	0.7
2	IT Skills	1	177	6.7	0.9
3	Relative Advantage	5	177	6.5	1.0
4	Utilitarian Outcomes	6	177	6.4	1.0
5	Needs	2	177	6.4	1.2
6	Requisite Knowledge	3	177	6.3	1.1
7	Infrastructure	2		6.0	1.6
8	Broadband Content	1	177	5.9	1.4
9	Hedonic Outcomes	3	177	5.8	1.6
10	Cost	3	177	5.4	1.8
11	Security	3		4.5	1.8
12	Personal Computer	1	177	4.4	2.7
13	Loyalty	2	177	4.2	2.0
14	Subjective Norms	3	177	3.2	2.1

portunities to adopt broadband in the home (Choudrie and Dwivedi, 2004a). As a result, the presence of constraints can inhibit a consumer's behaviour to adopt a specific technology (Ajzen, 1991). The factors of Perceived Behavioural Control (PBC) included cost, requisite knowledge, broadband content, needs and skills and new factors that emerged included infrastructure and personal computers (PC).

In terms of cost respondents felt that the price of the line rental, modem costs and the price of bandwidth caps are too high for them to acquire broadband service when compared to first world countries. Even though they were aware of recent price cuts in the South African broadband market this did not seem to change their perceptions on the cost of broadband services.

"Currently it is far too expensive. The initial cost, the initial payment of the modem, bandwidth caps, it costs too much. Frankly if you were in a non-African continent it will cost you far cheaper. The modem will be far cheaper and they have unlimited bandwidth for the same price or even less." (N5).

"Even with Telkom's recent price cuts which may make it more affordable to certain people I don't think it's worth it yet. I don't really work much at home mostly get my work done on campus. It's really the cost/work ratio" (N9).

However, even with the high prices of broadband, it still worked to be more cost effective than dial-up in the long term as one respondent points out:

"Broadband is faster than dial-up. You don't pay for the phone-call, broadband is a set thing. For the old dial-up modems you used to pay for as long as

you are online and you couldn't use your phone. With broadband you can still use the phone and it doesn't affect what you pay. So it's cost efficient especially in the long term" (C2).

Respondents were aware of the broadband technologies available to them and what broadband can do for them. Their awareness was affected by media, skill level, social influence, needs or following trends as two respondents points out: "I think I became aware through advertising. The companies advertise a lot. With media I became aware of it. And especially my need for it made me more aware of it as I did some research of what will suit me in that point in time" (C3).

"It is mostly due to working in the academic development...and it is part of my work. I've always been in touch with technology and even before a product is released, I've found out about it via my social network which mostly comprises of engineers" (C2). Broadband content ranges from video streaming and movie downloads to applications such as VOIP and video conferencing as respondent N7 highlights: "Faster you are able to do a lot more things. For example if I wanted to use Skype for instance I couldn't use Skype without broadband. If I wanted to download something I don't have to wait over night for it to download. You can use international sites, the whole international sites are built around, and they assume that you have broadband and if we don't have them in South Africa we can't wait for flash animations to load up. Also the new thing is streaming online digital streaming media. Things like YouTube and things like TV series and ads well and streaming radio stations" (N7).

There are various needs that broadband fulfils ranged from entertainment, communications, purchasing emails, surfing the web as one respondent point out:

"VOIP, cheaper calls, we would like to call everyone in the world and talk to them. With streaming audio and video it has the ability to chat meet and game with people from other countries....Communication is a prior-

ity. The ability to meet someone in the UK via broadband, dating etc. You can buy a car you can look for anything you want. You cut off the middle man" (N5).

Most of the respondents expressed that they acquired their skill levels through formal training, having an interest in PC and the Internet, were self-taught, started from a young

age, through social influence and from working in the environment. Increasing skills through relevant education was expressed as a concern:

"I think in the context of South Africa you need to educate the kids from the primary school level on how to use the computer. Just the basic things like word processing, Excel, how to use the internet, how to look up information and things like that. Children need a basic understanding of that" (C3). Respondents expressed that one of the reasons that influenced their decision to acquire their particular broadband service in their household was having an existing telephone line as one respondent highlights: "I chose ADSL because that was the service provided by Telkom or at least that could be linked to my telephone line" (C1).

Respondents mentioned that acquiring personal computers have an effect on the overall costs of subscribing to broadband services. If consumers perceive that the costs of buying a new PC and subscribing to broadband are too high then this may lead to not adopting broadband.

7 RESULTS AND DISCUSSION OF HYPOTHESIS TESTING

The aim of the testing was to determine which factors successfully predict the adoption of broadband in consumer households. A Reliability Test (Cronbach Alpha) and Confirmatory Factor Analysis was used to validate the various multi-item adoption constructs. To test whether the data was normally distributed, the descriptive statistics "Kolmogorov-

Smirnov" and "Shapiro-Wilk" tests were performed. Results showed that data was not normal and non-parametric tests were deemed appropriate to analyse the data collected. In order to test the statistical differences between adopters and non-adopters which were ordinal variables, a Mann-Whitney test was used. In order to explain the relationship between demographic variables and perceived behavioural control, a non-parametric Spearman's Rho (rs) test was deemed appropriate. To explain the relationships between the factors affecting broadband adoption (Attitude, Subjective Norms and Perceived Behavioural Control) and the adoption of broadband a logistic regression was used as the dependant variable (adoption of broadband) is nominal in nature. Table 4 shows that the model accounted for between 51.3% and 68.4% of the variance in broadband adoption.

7.1 Demographic factors

Literature states that the role of socio-economic attributes and the solitary use of demographic variables such as age, income, education and occupation help differentiate adopters from non-adopters (DCITA, 2004; Choudrie and Dwivedi, 2004b, Dwivedi, 2008). In this research, only the role of education was validated. Two

Mann-Whitney test confirming that the differences between the education levels of adopters and non-adopters was significant (Z = -1.920, p = 0.055).

■ The hypothesis H2b was accepted due to the rs test validating a "somewhat" significant relationship between the education levels of consumers and their skills in using broadband (z = -1.920, p=0.055).

7.2 Attitudinal factors

This research decomposed attitude into five dimensions: Relative Advantage (Rogers, 1995), Hedonic Outcomes, Utilitarian Outcomes (Venkatesh & Brown, 2001) and Security and Technology Comfort (DCITA, 2004). Using the results from the qualitative study, Loyalty was added as the sixth dimension for attitude. All six factors were expected to predict a consumer's attitude towards broadband adoption in South Africa. Two (H3b, H3e) hypotheses were supported by the data. The supported results are listed below.

■ The hypothesis H3b was accepted due to logistic regression results confirming that the probability of a consumer obtaining a broadband subscription if they did not perceive an entertainment value is low (β = .72).

■ The hypothesis H3e was accepted due to logistic regression results confirming that the probability of a

Table 4: Logistics Regression Summary for Broadband Adoption

MODEL SUMMARY			
Step	–2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	118.149a	.513	.684

demographic hypotheses (H1c and H2b) listed below, were supported by the data which meant that adopters of broadband had higher educational levels than non-adopters and the difference in education levels between adopters and non-adopters significantly explained their skills in using a PC and the Internet.

■ The hypothesis H1c was accepted due to the

consumer obtaining a broadband subscription if they did perceive comfort provided by broadband is high (β = 2.26).

Hedonic Outcomes is the pleasure derived from the consumption or use of broadband Internet. It is the entertainment potential of the Internet via offerings such as streaming audio and video and online games (Venkatesh and Brown, 2001). The results suggested that hedonic

outcomes had a "somewhat" significant influence on consumers' (adopters and non-adopters) intention to adopt broadband. This is in line with previous studies (Choudrie & Dwivedi, 2006; Daly et al., 2008) which argued that hedonic outcomes was an important factor that influenced a consumer's decision when subscribing to broadband.

An attitudinal factors that was not included in the Choudrie and Dwivedi's (2004b) Model of Broadband Diffusion but was deemed as essential for South African broadband uptake was that of technology comfort. The qualitative study suggested that most consumers felt that broadband technology was easy to setup, is user friendly and easy to learn. Technology comfort was found to have a significant influence on consumer's (adopters and non-adopters) intention to adopt broadband.

Consumers found more comfort in broadband than dial-up which offered constant disconnects slower speeds and higher monthly charges. Therefore the perceived comfort provided by broadband appeared to be high which contributed to the high probability of adopting it.

7.3 Perceived behavioural control factors
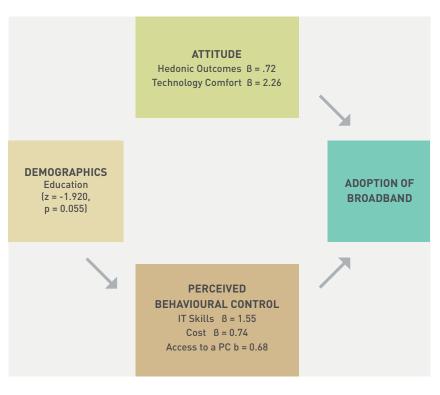
Three (H4b, H4d and H4g) perceived behavioural control factors were supported by the data. The independent variables included Skills, Cost and PC constructs (See Figure 3). The supported results are listed below.

■ The hypothesis H4b was accepted due to logistic

regression results confirming that the probability of a consumer obtaining a broadband subscription if they do have the necessary PC and Internet skills is high (β = 1.55).

■ The hypothesis H4d was accepted due to logistic regression results confirming that the probability

Figure 3: Model for broadband adoption in South African households

of a consumer obtaining a broadband subscription if they felt that the costs were too high is low (β = 0.74).

■ The hypothesis H4g was accepted due to logistic regression results confirming that the probability of a consumer obtaining a broadband subscription if they do not have a PC or their PC does not meet the minimum requirements is low (β = 0.68).

Previous studies in the UK suggested that high monthly cost was a major barrier that inhibited the adoption of broadband in the household (Choudrie and Dwivedi, 2004a; Koumbati, et al., 2007). The qualitative study suggested that both adopters and non-adopters

felt that the price of line rentals, modem costs and the prices of bandwidth caps are too high for them to acquire broadband services. Moreover, the recent price cuts in the South African broadband market did not seem to change their perception on the cost of broadband services. It should be noted that the price of broadband had reduced significantly since the qualitative study took place and this may have impacted on the overall results of the study.

The quantitative study provided evidence that the high costs of broadband had an impact on the intention to adopt broadband. Both adopters and non-adopters

ers, 2010). Until prices are reduced significantly in South Africa, there will be a lack of high adoption rates.

The use of broadband requires using the PC and Internet. The ease or difficulty of use and the requisite knowledge of a PC and Internet are expected to have an impact on broadband adoption (Naidoo et al., 2006; Yun, Lee and Lim, 2002). Findings from the qualitative study suggested that most adopters and non-adopters believed that they had the necessary skills to use a PC and the Internet. Most adopters expressed that they acquired their levels through either formal training, having an interest in PC and the Internet, being self-taught, starting from a young

Table 5: Multi-study comparison showing factors ranked in importance, *where "X" represent factors which are not significant and "✓" represents significant factors which were not ranked.*

STUDY	SOUTH AFRICA (THIS STUDY)	MALAYSIA (OOI ET AL., 2011)	INDIA (DWIVEDI ET AL., 2008)	PAKISTAN (DWIVEDI ET AL., 2007)	UK (DWIVEDI & IRANI, 2009)
Respondents (R2)	177 (0.5-0.7)	172 (not stated)	48 (0.49)	237 (0.36)	358 (not stated)
Utilitarian Outcomes	X	X	X	X	3
Hedonic Outcomes	4	4	3	X	X
Relative Advantage	X	3	1	Not tested	1
Social /Primary influence	X	1	X	3	√
Perceived requisite knowledge	X	X	X	4	√
Technology Comfort/ perceived ease of use	1	X	X	2	Not tested
Perceived IT Skills / self-efficacy	2	2	X	Not tested	2
Infrastructure / resources	X	5 (resources)	X	1 (resources)	√ (PC cost)
Broadband Cost	3	X	2	5	√
Relevant PC access	5	Not tested	Not tested	Not tested	Not tested

equally perceived that broadband prices in South Africa are still too high as compared to other countries. For similar prices in South Africa, consumers can get up to 5 times the speed and unlimited data plans elsewhere in the world. Particularly in the UK where consumers can purchase unlimited data subscriptions and a 50Mbps ADSL line (Mey-

age, through social influence and from working in the environment. Results from the quantitative study revealed that a skill was a significant factor in predicting broadband adoption. Previous studies show that the promotion of providing PC and Internet skills to users contributed towards the adoption of the Internet. Initiatives by the South Ko-

rean government led to removing barriers of self-efficacy which led to large-scale broadband adoption within a short period of time (Choudrie and Dwivedi, 2004b).

Moreover, other studies contributed to the body of research that finds digital literacy skills critical for bridging the gap between consumers participating in the information age and those consumers in lower-income or rural areas (Lee and Choudrie, 2002). Access to a PC was a new factor that emerged from the qualitative study and was deemed important as the first step in acquiring broadband. The quantitative study showed that Access to a PC significantly predicted broadband adoption. Moreover, data shows that Access to a PC had the second highest probability in predicting broadband adoption. Consumers believed that if they did not have a PC or their PC does not meet the minimum requirements to access the Internet, they would less likely adopt broadband.

7.4 The resultant model

The main conclusion drawn from the research study is based on the main underlying research questions proposed: What factors affect a South African consumers' decision to adopt broadband? The resultant model is shown in Figure 3.

Attitude and perceived behavioural control significantly explained a consumer's intention to adopt broadband. Within the attitude construct, technology comfort had a significant influence on broadband adoption while hedonic outcomes had a "somewhat" significant influence. With regards to perceived behavioural control, skills, costs and access to PC had a significant influence on a consumer's intention to adopt broadband. Overall, technology comfort had the largest part in explaining actual adoption. This was followed by skills in using a PC and the Internet, cost of broadband and having access to a PC. Amongst the four demographic variables, only education levels of consumers were associated with the adoption of broadband. Education had a significant effect on IT skills which in turn had an im-

pact on the intention to adopt broadband.

8. COMPARISON WITH PREVIOUS MODELS

In this section the South African model is compared to four other relevant studies (Table 5). The first study was mainly from the Karachi area in Pakistan (Dwivedi et al., 2007), the second study was from Mumbai India (Dwivedi et al., 2008), the third and largest study was a UK household postal survey (Dwivedi & Irani, 2009) and the most recent a study administered to consumers at a university in Malaysia (Ooi et al., 2011). This study does predict variation better but a limitation of this study is the low number of respondents and their limited distribution across South Africa. However previous research from developing countries suffers from similar limitations.

The comparisons are interesting. Comparing the UK study to the other studies, differences between developing countries and a developed country can be noted. Firstly, cost is more of a concern in developing countries with the factor being one of the top 3 in India and South Africa. Secondly the perceived entertainment value (Hedonic Outcomes) of broadband is a significant predictor in developing countries but not in the UK. Thirdly, usage of broadband for household activities (Utilitarian Outcomes) is a significant predictor of adoption in the UK but not in developing countries. South Africa also emerged as different to other countries. Relative advantage and social influence was significant in most countries tested but not in South Africa. Technology comfort of broadband was the dominant factor in South Africa with only India also showing significance. The new significant factor that emerged was access to an internet capable PC in South Africa, this was not tested in other country studies.

9. CONCLUSION

This study shows that education and IT training is crucial to increasing Broadband adoption and that if the cost of broadband and personal computers don't decrease,

South African broadband adoption will remain well below other countries. From a practical viewpoint these findings need to be considered by government, Internet Service Providers (ISP), business consumers and public organisations as it can allow them to make better informed decisions on development and pricing decisions. This research, from an academic perspective, adds to the existing literature on broadband diffusion and proposes a generic model for broadband adoption that could be validated in any country; it also proposed and validated a model relevant to the current South African context. By using current research to form the foundation of the study, the research built on the body of knowledge to further the understanding of broadband adoption in residential households. The approach used in this paper is different from other studies in this field, as this study used mixed methods and through initial interviews inductively looked for new themes rather than merely validating instruments used previously.

This approach proved valuable as new factors emerged and a richer understanding of existing factors was obtained. The predicted variation was also higher, however more of this research is needed as studies in this area have only been able to show 50% of the variation and therefore new factors need to be found. Future qualitative studies would therefore be valuable. For example, researching specific areas such as new communication applications and downloads and entertainment. Moreover, other specific areas such as diffusion and sustainability of broadband technology, family and work life, social networks and online security and privacy will need to be explored.

This study focused on unravelling demand side issues as broadband growth was constrained due to consumers being reluctant to subscribe to the technology. As such it was noted that investigating supply side issues was out of scope of this research study. Supply side issues in terms of infrastructure developments, policies and regulations also contribute to the lack of broadband uptake in the country. It is therefore recommended that future research also focus on investigating supply side issues in order to gain a holistic perspective of both sides.

Finally, due to a high mobile phone penetration rate in South Africa, there are also a number of people who are accessing mobile broadband data services in the rural areas of South Africa. These users may not have the same income and education levels as the sample of this study. As such, future research may be deemed important to investigate the use of mobile broadband data services in more rural parts of South Africa. END

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A CASE STUDY ON
THE BUSINESS CORRESPONDENT MODEL IN INDIA

by Ishita Ghosh and Kartikeya Bajpai India

Branchless Banking solutions are being tested around the world to achieve financial inclusion targets. India's Business Correspondent (BC) model is a bank-led branchless banking solution that allows different types of individuals or institutions to become BCs and provide formal financial access to unserved or under-served regions through designated Customer Service Points (CSPS). This case study provides a preliminary insight into Technology Service Providers (TSPs) as a type of BC, surveying their technology, operations and services. A large public sector bank and the regulatory banking body are also studied with respect to TSPs. The analysis posits three discussion themes that highlight the current challenges and emerging innovations in this domain.

OVERVIEW

In January 2006, the Reserve Bank of India (RBI) enabled Non-Governmental Organizations (NGOs), Self-Help Groups (SHGs), Microfinance Institutions (MFIs) and other Civil Society Organizations (CSOs) to serve as an interface between banks and prospective customers, in a strategic bid to enforce their financial inclusion mandate following their 'no-frills' bank account drive that was launched in 2005. These prescribed intermediaries were now able to conduct financial transactions on the bank's behalf as Business Correspondents (BCs), or provide facilitation services for the bank as Business Facilitators (BFs) [1]. In that sense, therefore, BCs were capacitated to carry out all BF functions, with the additional facility to take deposits and disburse credit on behalf of the bank [2].

Therefore, the BC model is a form of branchless banking that combines a technology backbone to enable remote transactions, as well as an agent network that can facilitate cash-in/cash-out movement. To this end, in the wake of the recommendations made by the Rangarajan Committee report, the Financial Inclusion Technology Fund (FITF) was set up in 2008. This fund clearly draws out the role of Information & Communication Technologies (ICTs) in achieving the government's financial inclusion goals[3].

It may be de rigueur to take a step back and appreciate how larger financial institutions may find it infeasible to manage the burgeoning costs of handling small value transactions. Branchless banking models could assume the shape of a hybrid model as such, where these larger institutions may join forces with local organisations and leverage their infrastructure on the ground to reach out to unbanked populations [4]. This can help manage risks at the larger and strictly regulated financial service provider end, expand outreach within unserved regions through the local resources, and thereby achieve financial inclusion targets. The Business Correspondent serves as an exemplar of such a hybrid model.

A working group that reviewed the state of the Business Correspondent Model submitted a comprehensive report to the RBI in August 2009 to ascertain who exactly were serving as the most effective BCs. This report observed that while a variety of organisations or individuals have been granted dispensation to act as BCs, only certain types were commercially viable, and thus prominent. The report stated that most of the BCs appointed by banks were Section 25 companies/trusts/societies, and that, further, these Section 25 companies were floated by Technology Service Providers who furnished the technology platform for performing BC activities. This is as per RBI regulations that dictate that only not-for-profits may be engaged as BCs [5]. This paper will concern itself with Technology Service Providers as the dominant type of BC.

THE BUSINESS CORRESPONDENT MODEL

As a form of branchless banking, the BC model is characterised by its fundamental features: the technology vendor who facilitates the completion of the electronic transactions and processing, the maintenance of the transaction database and transaction security, and the authorisation of the unique customer access; the Customer Service Points (CSPs) that house the infrastructural facilities to liquidate and trade against electronically valued currency, perform account opening (KYC) requirements, and mainly handle cash-in/cash-out transactions; and the BC organisation (or individual) itself that manage and coordinate the network of the points of transactions outside of a physical bank branch[1, 6]. In this manner, therefore, the BC organisation (or individual) and the CSPs together constitute the "agent network" - a more familiar designation in the branchless banking parlance.

DATA COLLECTION

This case study is both exploratory and confirmatory in nature [7]. Since information on the Banking Correspondents model is currently available in a diffused manner (a motivation driving this study), we applied a multi pronged data collection methodology which included in-person interviews; policy documents of the technology service providers, banks, and regulatory institutions; websites of the BCs; media reports on the BC model; and, interestingly, data revealed through public interest Right to Information (RTI) filings.

TECHNOLOGY SERVICE PROVIDER I: ZERO MASS FOUNDATION (ZMF)

The first Technology Service Provider (TSP) Business Correspondent that we will review is the Zero Mass Foundation, which is a Section-25 company, created by A Little World (ALW), a domestic payment system developer located out of Eastern India. ALW is a for-profit market leader in financial inclusion strategies and tools to facilitate the disbursement of government payment schemes, whereas ZMF is the sister company, non-profit entity that furnishes the physical agent infrastructure to complete the transactions on the ground. ZMF works with village based operators to enable a dedicated human interface network in unserved regions. Therefore, ZMF maintains manned outlets for deposits, withdrawals and transfers [8].

"Whatever technology you use, whatever ATM you put, whatever bank you put, but you should have a human interface." - -Representative from Zero Mass Foundation

Technology

ALW provides the end-to-end technology for ZMF operations which includes the front and back-end technology, as well as the running of the centralized Data Centre operations which receives and records all financial transactions activity. ALW provides technology support for customer enrollment, with a customer headshot and fingerprint biometrics on a proprietary device which can communicate through the mobile network with the server. In addition, ALW provides the partner organisations the option of choosing between an open source account management system or a customised solution to connect with the bank's banking system. Lastly, ALW offers other related services such as smart card solutions, account security man-

agement and a cash management system [2, 8]. ZMF's customer service providers or CSPs are completely reliant on ALW's customised agent banking mobile phone to conduct remote transactions, the details of which are immediately communicated with the central server [2]. If a CSP services an area that has inadequate or no mobile network coverage, then he must record all transaction information offline, and wait to move to an area with coverage, update the information, and then send it to the central server. At the end of each working day, a designated ALW staff will share the information from the server with the representative bank.

Operations

At the beginning of the day, the CSPs download the details of existing customers, including their account information from the central server. The CSP then travels to the designated areas. Here, if a potential customer wishes to avail of the many services offered, and chooses to enroll, the CSP takes a photograph of the client with a high-resolution camera and captures his/her biometric information with their agent banking mobile phones. On completion of the registration process, the new customer is presented with a bio-metric photo ID and a ZSN number [2].

Existing customers may approach CSPs with this bio-metric ID and ZSN number. Thus, the CSP is able to retrieve the customer's details. The CSP can now navigate to the Transaction menu. Depending on the type of transaction to be performed on behalf of the customer (deposit, withdrawal, remittance), additional information is asked from the customer. Only for withdrawals, does the CSP solicit the fingerprint details of the customer which is recorded on the fingerprint reader device on the agent mobile phone.

Services

ZMF supports a number of services for partner banks, for instance in the case of SBI, ZMFs' website

claims to support the following services, "no-frills pre-paid account, micro-credit, micro-insurance, cash withdrawals, cashless payments, SHG savings and credit accounts, salary disbursements for specific schemes, passbook facilities, EMI payment options, government benefits disbursements, utility payments, loyalty points and coupons facilities, and automatic fare collection support" [9].

TECHNOLOGY SERVICE PROVIDER II: FINANCIAL INFORMATION NETWORKS AND OPERATION (FINO)

Financial Information Networks and Operation (FINO) is currently the largest branchless banking services provider in the Indian market with 14.5 million customer accounts [10]. FINO provides agent services through their sister concern FINO Fintech Foundation [11]. FINO's service delivery model incorporates two unique systemic features, (i) the use of smartcard technology along with biometric (fingerprint) identification [12], and (ii) 'doorstep banking', which involves the CSPs delivering banking services to the doorstep of the end customer. The majority of FINOs customers have been enrolled either under financial inclusion or government payment mandates [11].

Technology & Operations

In terms of technology, FINO agents are equipped with a fingerprint recorder, a receipt printer and a network device to communicate with the back end server [11]. A smartcard is issued to customers after recording a headshot, fingerprint biometrics, and other basic Know Your Customer (KYC) details. The smartcard contains both the customer biometric and account details. To conduct transactions, the smartcard is swiped by the FINO agent, and the customers fingerprints are used as a proof of identity. The customers are

provided with the cash and a receipt of the transaction. FINO differs from other service providers in their inclusion of doorstep services, which they facilitate by taking care of liquidity management for their agents [13]. So, in effect, by removing the trips of the agent to the bank for cash management purposes, FINO frees up agent resources for doorstep services. The basic purpose of any technology solution is that it should be able to address the need of the market. When FINO started its business four years ago, the need was to provide a banking solution which should address some basic needs like connectivity issues, security, user mobility, illiterate user base etc.

REPRESENTATIVE FROM FINO [14]

Services

FINO in its role as a technology services provider supports a range of financial services, including disbursements for government programs such as National Rural Employment Guarantee Act (NREGA), Rashtriya Swasthya Bima Yojana (RSBY) and Swavalamban Pension Scheme (SSP) [12], remittances, savings, loans and micro insurance services. FINO also provides customer enrollment services to PSUs, insurance companies and other financial institutions.

TECHNOLOGY SERVICE PROVIDER III: EKO INDIA FINANCIAL SERVICES PRIVATE LIMITED (EKO)

Eko India Financial Services is a technology service provider which acts as a Banking Correspondent through its non-profit arm, Eko Aspire Foundation [15]. Eko began its BC operations with the State Bank of India as its primary partner. Eko, unlike the other two TSPs profiled, emphasizes the role of client side mobile

platforms. "I believe that the Business Correspondent [BC] model is an infrastructure model that uses technology. You are putting infrastructure of outreach locations, last mile distribution and the other things that enable transactions to happen in an auditable, real time manner."
-Representative from EKO [16]

Operations

Eko emphasizes a phone based approach which eliminates the complexities inherent in an SMS based system [17]. CSPs offer customers access to no frill accounts, the set up of which minimally requires access to a mobile phone. The use of a client side model eliminates outlays on the CSP side for a smartcard reader, or any such similar POS device [15]. Eko transactions utilize the Unstructured Supplementary Service Data (USSD) service to create a simplified transaction format. Customers type the bank's code, followed by an asterisk, then the mobile number of the person being paid, followed by an asterisk, followed by the amount, followed by another asterisk and, lastly the digital signature [17].

The digital signature includes a code printed in a booklet supplied to the customer by the CSP. The printed code, along with a 4 digit pin set by the customer, forms the signature. Hence, the loss of the physical artifact (i.e. the printed booklet) does not lead to a compromised account. The completed transaction is then confirmed by an SMS to the customer.

Despite being a technology service provider that enables customer-end mobile banking, EKO is circumspect about a one-solution-fits-all service. An interview with an EKO representative earlier in the year, demonstrates their discernment of their target market [16]. They recognized that the comfort convenience barrier affected adoption rates, and that a lot of people were still not comfortable

using their cell phones, especially to perform more complex functions such as conducting financial transactions.

Services

Once the customer establishes an account, they can avail a full range of financial services such as deposits, withdrawals, remittances, payments, and micro-insurance services. However, our interactions with EKO representatives show that there has been a shift in organizational focus from their savings product to their remittance product, as the latter is proving to be a more lucrative option at a lower cost to the company. The organization still believes that the uptake of the savings product may be rapid and sustained, and therefore, attractive for service providers. However in order to achieve this, dedicated financial literacy drives that emphasize the benefits of savings instruments especially for low-income populations, need to be targeted more aggressively.

Indeed, there was a suggestion that the only barrier to the uptake of savings products may be the lack of a nuanced understanding of how locked-away money may reap its own benefits. The Eko representative stated that they were in talks with their partner banks to persuade them in undertaking the responsibility for the financial literacy drives, although to this end, a decisive conclusion was yet to be reached. It was evident that Eko did not host the capability of promulgating these drives themselves, and that alternative platforms for disseminating this information were limited in discussion.

State Bank of India (SBI)

The State Bank of India, the largest public sector bank in the country, was among the first and most prominent banks to test the BC model. Initially, SBI partnered with EKO Financial Services as their technology service provider, however over the years SBI has experimented with different types of BCs as well as technology service providers. In late 2006, Zero Mass piloted their technol-

ogy platform with SBI. FINO partners with SBI to offer their no-frill bank accounts in the state of Karnataka[11].

SBI's target of the number of villages to be covered within their financial inclusion mandate is higher than the targets of any other bank, since SBI has the largest network of existing branches in the country today. The BC model, therefore, may be an inclusive solution to achieve, specifically, SBI's financial inclusion targets for two reasons: the BC model takes SBI's banking services out of their physical branches and into unserved regions at a lower cost, and the RBI guideline to restrict BCs within 30 km of the nearest physical branch may be far from a deterrent for SBI (as compared to other banks) given their heavy branch density within the country.

"However, opening a brick and mortar branch is very expensive model requiring a lot of capital expenditure recurring expenses and manpower, the branch incurs loss for a long time. On the other hand, Business Correspondence model enables the Bank to provide banking services at the door steps of the villagers and it's very economical too."

Representative from SBI

According to a recent Right to Information application filed by MediaNama [18], which covered the period of operations ranging from July 2010 to August 2011, SBIs' distribution network utilized 2291 Business Correspondents which interfaced with 27,889 CSPs. EKO Financial services was responsible for Rs 1422 in transactions over the same period. This distribution network has lead to an increase of 45.09% in transactions through BCs. While remittances have grown strongly (a staggering 1726.39%) because of the BC model, it has yielded mixed results in terms of deposits, which contracted by 22.36%.

SBI's key concerns while choosing and allotting a BC partner are the facilitation of basic banking services (such as account opening, deposits, remittances and payments etc), ease of operation, low-cost, and seamless integration with SBI's core banking system. Interestingly, technological innovation may be instrumental in

bringing operation costs down.

"Normal tendency is to sell a technology and continue to do business with that technology, whereas, in practical life, many innovations take place and costs of equipments come down in price by almost 30% per annum. Thus the BCs need to continue to innovate on their technology so that its competitiveness remains."

Representative from SBI

The Reserve Bank of India (RBI)

This section will provide an overview into a subset of RBI's larger BC model guidelines that frame the bank-BC relationship, especially those that may be particularly relevant for Technology Service Providers. The Business Correspondent model in India is bank-led, by which it is implied that the bank becomes ultimately responsible for the partnership with the designated BC. In that sense, the financial inclusion mandate is a developmental undertaking, and not a regulatory function, for the RBI.

"As in India, it's a bank led model, accountability falls on the bank. BC is not a bank, hence RBI or NABARD's regulation does not arise."

-Representative from the RBI

In the initial days, the RBI had directed that the commissions to the BCs be borne by the partner bank, which could not be transferred to the customer [5]. However, a later appraisal of the financial sustainability of the BC model moved the RBI to relax this rule, and now banks are permitted to levy a reasonable fee that is directly charged to the customer [19]. In general though, both banks and BCs regard the BC model as non-profitable as operating costs for BCs are high which can neither be transferred as a significant burden to customers, nor does the regulatory provisions allow for lucrative margins [2]. For instance, banks may sometimes allow their BCs to perform credit evaluation although they are not permitted to charge a fee that is more than their prime lending rate (PLR), as per RBI guidelines. In this situation, the only way the bank-BC partnership may

increase their profit margins, is if the bank were to increase their PLR, which evidently they will be reluctant to pursue [2].

Further, the RBI has also foreseen certain reputational, legal and operational risks that the bank is accountable for. While technology has been expected to reduce some of these risks, and such solutions are encouraged by the RBI, certain risk-mitigation strategies have been further stipulated by the RBI to manage potential risks [5]. These stipulations are:

Limits on cash-holdings by the CSPs and on individual customer payments & receipts

This limit is established by the partner bank and is specified in the agreement between the bank and the BC.

All transactions must be settled between BC and bank by end of day or next working day

This guideline, that BCs must settle all accounts with the local bank branches within 24 hours of the transaction, has been regarded as a constraint to CSPs' movement to reach unserved regions. This has also been cited as a regulatory concern by key actors in the industry, and an extension of up to 96 hours has been suggested contingent on the preferred BC's capacity [1]. However, the 24 hour mandate seems to be more a guideline on paper, whereas accounts may actually be settled within 72 hours in some cases. As stated by a representative from ZMF, 30-35% of the country is as yet not covered by mobile coverage, and therefore in these areas, only offline transactions can be conducted. Moving to a coverage area and updating the main server as well as the service provider server in such situations may frequently take between 24 and 72 hours.

The bank remains completely responsible to the customer for all acts of omission and commission of the BC

Indeed, this accountability remains persistent, even if any activity by the bank is outsourced. The responsibility ultimately lies with the bank, its Board and other senior management [20].

Therefore, it is inevitable that the RBI dictate that the distance between the place of business for the BC and the local bank branch may not exceed 30 kms in rural, semi-urban as well as urban areas, so as to better capacitate the bank to supervise the BC operations. The RBI has, however, issued a mechanism for the relaxation of this criterion, that is by seeking the permission for a waiver from the District Consultative Committee (DCC) [5]. However, industry feedback [2] suggests that such requests often face long turnaround times for approval, or worse, rejection without adequate explanation.

Yet, an RBI representative justified the distance criterion by emphasizing the need for banking structure even in the absence of a physical bank branch. Cash in transit is vulnerable to potential risks, and therefore the BC needs to be under the oversight of the designated base branch. The RBI does encourage banks to invest in low-scale banking models or intermediary structures so as to retain the formal banking structure at a lower cost, as well as to increase BC outreach.

Recently the RBI, after disseminating a discussion paper on the engagement of for-profit companies as Business Correspondents [21], has granted them this permission. This has raised questions within the industry about glaring disparities in terms of infrastructure leverage, operational costs, break-even bounds and BC margins between the different types of BCs. However, the RBI has emphasized the more robust organizational capacity and larger resource pool of for-profits, and the likelihood for them to continue as BCs for a sustained period of time, which inherently makes them attractive as potential BCs. This may have implications for Technology Service Providers which will be addressed in the Discussion section later.

"It is the survival of the fittest. RBI has the role to prepare a conducive environment for greater Financial Inclusion."
Representative from RBI

DISCUSSION

Evolving Technology

The notion that technology must continue to innovate, especially within this industry, has been a consistent

theme not only within the technology service providers, but also the banks as well as the regulatory body. Providing access to formal financial services in unserved regions is fraught with challenges. Infrastructure is a concern. Further, low-value transactions typically do not justify heavy investments in these areas. Indeed, as a representative from ALW stated, "Conventional devices can never meet an unconventional set of challenges."[22].

The biggest challenge that the BC model faces is that of low margins. Innovative technology solutions may help in bringing operation costs down, which may improve margins for the BC, as well as make the model more lucrative for the partner banks, as was observed by the representative from SBI. Further, as the representative from FINO stated, technology innovation can also help address the recurring concerns within the BC model. These include adequate security measures for the cash in transit issue, provision of customized solutions for illiterate or semi-literate populations, and improved mobility at the customer-end by helping them in conducting transactions on their own network devices, rather than with agent-assisted ones.

Evolving technology solutions may also help in building low-scale banking structures, as stated by the RBI representative, that can improve agent-mobility within the current regulatory checks and thus extend outreach to a wider circumference. Finally, evolving technology may also play an assistive role in moderating the discrimination amongst services offered on the service provider end for motivations other than customer demand. For instance, customized technology platforms may be leveraged to reduce the costs of disseminating financial literacy information that may encourage Eko to revive their offering of the savings product.

Mobile Technology at Agent and Customer end

With the rapid diffusion of mobile phones, mobile banking has been touted as a promising solution to deliver financial services directly into the hands of customers in unserved regions. The BC model in India is using mobile banking at the agent-end to enable CSPs in conducting financial transactions on behalf of customers, as well as to communicate this information to the data servers.

However, of the three TSPs that we have reviewed, EKO is the only player in enabling customer-end mobile banking. Interestingly, EKO recognizes that some customers may be indisposed to conducting financial transactions on their mobile phones. This is further echoed by ZMF and FINO representatives. Indeed, as observed by the ZMF representative, unserved regions frequently tend to have mobile phone users who can only make and receive phone calls, and who may be unable to even send or receive SMSs. Similarly, a FINO representative asserted from their experience that most customers preferred conducting financial transactions with the help of agents (and therefore, engage in agent-end mobile banking), as opposed to performing these transactions themselves[14]. Customer-end mobile banking most certainly has huge potential by eliminating or diminishing the assistance of an intermediary and bringing formal financial services into the hands of customers. And such a shift in the BC paradigm (which currently is mostly CSP-assisted) need not have a prohibitive impact on agent margins. In effect, such a shift will compel the restructuring of the commission structure, where instead of receiving a percentage of transactions conducted, agents may now receive a percentage of the conversion of cash to electronic currency and vice versa, as is prevalent in mobile banking models in Africa. Indeed, the financial education impetus, that the RBI Working Report has encouraged within the industry [5], could include training on customer-end mobile banking. This may also help build customer trust towards branchless banking, as customers will be performing the transactions themselves.

Technology Service Providers versus Other BCs

As far as who a potential BC can be, it is pretty much a free market. The RBI guidelines have evolved over time to enable different types of BCs to function in

the market. More recently, the inclusion of for-profits to now serve the market has been met with some trepidation. Margins become a concern as they naturally equip for-profits with an advantage in terms of how long they can survive in the market before breaking even or making profits, a significant advantage in a high cost-low margin game. An interview with an EKO representative earlier this year confirmed this, "I know that for about 100,000 customers I can lose money, but beyond that, it is a challenge. For HUL or Airtel it is 10 million customers. That will create unequal field. So RBI must try and create and ensure that there is a level playing field." [16]. Further, high-profile partnerships have been forged between banks and operators within the past year. These include Airtel-SBI, Vodafone-ICICI Bank, and Idea-Axis Bank. The partnerships can leverage the large existing retail networks of the operators to double-up as functioning CSPs almost immediately, their high investment and high customer acquisition targets can overcome the low margins inherent of the BC model to achieve scale, and therefore these partnerships may provide fierce competition to Technology Service Providers.

However, TSPs have the distinct advantage of being a one-stop shop for furnishing both, a technology platform as well as the distribution network, to perform branchless banking functions, and this may continue to hold them in good stead. With the RBI most concerned with fulfilling their ambitious financial inclusion mandate in a developmental capacity, the disparities between different types of BC players may not be addressed adequately by their constantly evolving guidelines. It remains to be seen how the various BCs will match up against each other over the coming years, especially in terms of identifying the most effective BC types within the crop.

CONCLUSION

This case study profiles Technology Service Providers as a category of Business Correspondents in India. To this end, the three dominant players in the market have been reviewed, and an overview provided of their technology, operations and services. In addition, the case study also looks at a large public sector bank that has engaged with the three Technology Service Providers at some point, as well as the regulatory banking body. Based on our analysis, we present three discussion themes: the relevance of evolving technology for the BC paradigm, the prevalence of mobile banking solutions at the agent and customer end and its implications, and finally the position of Technology Service Providers with respect to other Business Correspondent types, especially with the recent entry of for-profits in the industry. In this way, this case study provides a compact view of a relatively diffused literature. Indeed, in outlining the fundamental aspects of the business correspondent model, this paper hopes to present a foundation which can allow future work to potentially posit more critical views of the model within the Indian context. END

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LEARNING FROM
E-ARIK PROJECT
IN NORTH-EAST INDIA
A CASE STUDY

by Raj Saravanan

Implementation of variety of Information and Communication Technology (ICT) projects in rural India during last two decades indicated mixed results (few ICT projects are promising and most are floundering) in providing agricultural information to the farmers. The e-Agriculture projects like aAqua, e-Sagu, Digital Green, KISSAN Kerala, Lifelines of India, TNAU AGRITECH Portal, AGMARKNET, IFFCO Kisan Sanchar Limited (IKSL) and ITC-e-Choupal have shown some promise towards scaling up. The numbers of ICT initiatives in rural India were not replicated among the rural tribal poor. There is no noteworthy village level e-Agriculture initiative in the tribal population dominated eight states of North-East India, where communication and access to appropriate farm information is difficult task for farmers and other stakeholders. Hence, the e-Arik (Arik means "Agriculture" in Adi tribal Dialect) project was initiated to examine the application of ICTs in providing agricultural extension services and to measure impact of ICTs among rural tribal farming community of the Arunachal Pradesh State of North-East India in 2007. The e-Arik-Village Knowledge Centre with ICTs and human intermediation facilitated all time farmers query resolution and expert consultation for the 500 tribal farmers in 12 remote villages. Innovative approaches like farmer to farmer communications, media mix, information reinforcement by ICTs were had a positive impact on adoption of sustainable farm technologies and farmers income. The e-Agriculture prototype also demonstrated that Rs. 2400 (USD 53) to avail extension services was saved by per farmer per year and to provide farm

times reduced expenditure was incurred in comparison with the conventional extension system. Sixteen fold less time required for availing the services by the farmers and three fold less time required to deliver the services to the farmers compared to conventional extension system. However, author of this article argues that in less developed areas, information through ICTs alone may not create expected development. Along with appropriate agricultural information and knowledge, field demonstrations, forward (farm machinery, manure, seeds) and backward linkages (Post harvest technology and market) are need to be facilitated with appropriate public-private partnership of knowledge and other service providers for agricultural development.
Keywords:

1. INTRODUCTION

Agriculture extension continues to be a key facilitator to achieve food security and also to reduce poverty of the majority of the rural population in most of the developing countries including India. Research evidences show that the rural livelihoods are considerably enhanced by access to the information on improved agricultural practices, market, weather etc. Further, land and water resources are almost reaching its limits and hence, knowledge resource plays a crucial role to achieve food security. Hence, agricultural extension, as an enabler of knowledge resource is getting renewed attention across the globe. Most national governments and agricultural stakeholders are trying to revitalise their extension systems. However, estimates in India indicated that to disseminate the advanced agricultural technological information to the 120 million farm holdings requires at least 1.3-1.5 million extension personnel against which present availability is only 100000 [1]. Further, even after continuous efforts of extension organisations, 60 per cent of the farmers do not access any source of information for advanced agricultural technological information resulting in huge adoption gap [2]. Hence, extension reforms are underway and integration of new Information and Communication Technologies (ICTs) are rapidly transforming the agricultural extension. The ICT enabled extension systems are acting as a key agent for changing agrarian situation and farmers' lives by improving access to information and sharing knowledge. It is believed that the ICT based agricultural extension brings opportunities and has the potential of enabling the empowerment of farming communities. And hence, extension practitioners are interested to experiment innovative e-Agriculture initiatives in India [3].

1.1. STATUS OF E-AGRICULTURE INITIATIVES IN INDIA

The reports indicated that 45 per cent of the world's ICT projects implemented in India [4]. And also Asia's highest number of information kiosks implemented across rural India. However, the most of the rural ICT projects are implemented in the socio- economically developed states of South and North India [5]. Numbers of ICT initiatives are documented in the literature [3] and also available in online www.ekrishinaip.in. Some of the innovative e-Agriculture initiatives in India are indicated below.

1.2. STATUS OF E-AGRICULTURE INITIATIVES IN NORTH-EAST INDIA

In contrast to national e-Agriculture scenario, there is no village level e-Agriculture initiative in the

poorest tribal population dominated eight states of North-East Hill region of India. Considering the geographical remoteness of the region, Ministry of Information Technology, Government of India implemented Community Information Centres in all the head quarters of 487 blocks of 79 districts of North-East India. But, the functioning of the centres not up to the expectation. The basic purpose of community information centeres to provide e-education, e-governance, e-health and e-business opportunity not realized and centres merely act as a internet browsing centres to elite and educated urban population. For effective functioning of Community Information Centres (CICs), the locale specific content needs to be generated. The e-readiness assessment reports, 2004 & 2008 of Government of India [6, 7] indicated that Arunachal Pradesh State categorized under least achievers category. The report also recommends increasing the awareness of potential benefits of ICTs in rural development.

1.3 STATEMENT OF PROB-LEM & OBJECTIVE OF THE STUDY

The North-East region of India has exhibited most backwardness in most important indicators of human development such as income and health [8]. Further, low agricultural productivity, endemic malaria, drug addiction and AIDS add the problem of the North- East India. The non-income poverty in terms of inadequate information on advanced farm technologies, market intelligence and rural development schemes produces the income poverty in the region. The limited technical manpower, lack of transport and communication facilities, limited financial support to the technology transfer and less infrastructure facility creates huge technological gap among rural tribal farming community. Further, difficult terrain,

mountainous periphery and frequent natural disasters hinder the development of the region. Due to non-availability of improved technological information to the tribal farmers, agriculture exhibits low unstable productivity, which makes food insecurity problem and also poses serious developmental question to the policy makers.

Considering disappointing development scenario in the region, a research project entitled 1"e-Arik" ("Arik" means "Agriculture" in the Adi tribal dialect of Arunachal Pradesh State and e-Arik means 2e-Agriculture) has been implemented by the College of Horticulture and Forestry, Central Agricultural University (CAU), since 2007. This research project was sponsored by the Technology Information Facilitation Programme (TIFP), Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India, examined the application of ICTs in providing agricultural extension services and its impact among rural tribal farming community in the "Yagrung" and near by villages of East Siang district of Arunachal Pradesh State.

2. LOCALE OF THE STUDY

2.1. Description of the Study Area

The selected villages are located in the East Siang District of Arunachal Pradesh State. The 3Adi, is one of the major tribe living in the eastern Himalayan hills and they are found in the sub-tropical regions within the districts of East Siang, Upper Siang, West Siang and Dibang Valley Districts of the Arunachal Pradesh State of North-East India. The literal meaning of Adi is "hill" or "mountain top". They have well organised traditional village council called 4Kebang. The average annual rainfall is 440 cm. Generally, rocky sandy loam soil with the pH ranges from 5 to 6.5 and sub-tropical climate condition favours cultivation of a wide range of crops. The major cultivated crops are rice, mustard, maize, mandarin orange, pineapple and vegetables

SL. NO.	NAME OF THE PROJECT	INNOVATIONS AND IMPACT
1.	aAQUA	Online discussion, archived, multi-lingual and multimedia based. 27674 posts 3.3 million views by 12,964 viewers.
2.	e-Sagu	Agro-advisory services by digital photographs for 3035 farmers (4130 ha). Benefited Rs. 9491 (USD 240) per ha.
3.	Digital Green	Participatory video for agricultural extension. 1681 videos produced and 60313 farmers involved. Increased seven fold more adoption of farm practices and ten times more effective per dollar spent as compared to traditional extension system.
4.	KISSAN Kerala	Content processing and dissemination system. Online information, video channel, Tele-advisory, SMS and GIS based agro-services.
5.	Lifelines India	Connectivity by innovative mix of internet and telephony. Reaches 200000 farmers in three States of India.
6.	TNAU AGRITECH Portal	Dynamic portal and e-linkage with research stations and farm sciences centres for agro-advisory services.
7.	AGMARKNET	Market information by portal. Information on 2000 markets and 300 commodities in India.
8.	India Development Gateway (InDG) portal	Multilingual portal for agriculture and other rural information. Decentralized content management system by 225 institutional partners and others.
9.	IFFCO Kisan Sanchar Limited	Voice messages in local languages. 95,000 voice messages delivered and 81000 Q&A repository with 5000 feed back messages from the farmers.
10.	ITC-e-Choupal	Innovative trading and e-Commerce initiative in agriculture. Reaches 4 million farmers by 6500 e-Choupals.

in the foot hill and mid hill areas. The prevalence of shifting cultivation ("Slash and burning" or "Jhum" agriculture system) also called as 5Jhum cultivation, which involves slashing and burning of the vegetation on hill slopes and using the land for cultivation for two or three years. Then farmers move to new area for doing the same practice. In recent years, the Jhum cycle interval is reduced to two to three years (Earlier days it was seven to eight years of jhum cycle), and the farmers return to the same area for doing shifting cultivation [9]. The Adi tribe extensively practice irrigated rice cultivation and have a considerable agricultural economy [10]. Traditional farming systems, ecological pest and diseases control measures, bio-diversity conservation and traditional homestead agro-forestry systems are unique to the Adi tribal farmers [11, 12].

3. PROJECT METHODOLOGY

3.1. Farmers Information Needs Assessment

A survey was conducted to assess the farm information input pattern, information needs and Information & Communication Technologies (ICTs) preference of 60 farmers of Yagrung, Tekang and Kangkong villages of East Siang District, Arunachal Pradesh State was conducted during August and September, 2007. Results indicated that most of the farmers (40 per cent) getting the agriculture related information from the Radio. The Farm and Home programme regularly broadcasted by the AIR, Pasighat. The radio programme on "Farm and Home" was regularly broadcasted during 5 pm to 6 pm. Twenty eight per cent of listeners were expressed that the farm related programme was useful for them. The radio programmes were broadcasted in Adi tribal dialect, and hence, an overwhelming majority of the farmers become radio listeners.

In contrast to this, only 4 and 14 per cent of the farmers were regular and occasionally viewing farm related programmes in TV, which is due to the fact that majority of the tribal farmers not well acquainted with Hindi language. Few farmers (8 per cent) were getting information from the agriculture and horticulture departments. This is due to the fact that there is inadequate technical manpower in the agricultural developmental departments. Further, tribal farmers land holding is scattered and located far away from the villages, hence, for extension personnel it is difficult to visit number of farms.

Further, the developmental departments runs with regular constraints such as; inadequate technical manpower, lack of standardized location specific technologies, lack of training facilities for extension personnel, lack of conveyance facilities, lack of essential teaching & communication equipments (AV aids & ICTs), non-availability of inputs in time and lack of quality inputs. The Krishi Vigyan Kendra (KVK), East Siang district was started during 2006, had few Subject Matter Specialists (SMS) and conducted limited number of extension activities. The private sector such as agri-business firms, input dealers, print media and NGOs involvement in agriculture technology transfer was negligible [9].

3.2. ICT Availability, Access and Usage among the Tribal Farmers

A survey was conducted to find out the availability, access and usage of ICT indicators in the three villages namely; Yagrung, Tekang and Kangkong villages of Pasighat circle of East Siang District of Arunachal Pradesh state, during September, 2007. A structured interview schedule was developed based on the International Telecommunication Union (ITU) and United Nations Conference on Trade and Development (UNCTAD) identified ICT indicators on the "Access to", "Usage indicators" (on age, gender education, frequency and purpose) and ICT infrastructure. Information was collected from the 60 farm households. Findings indicated that four-fifths of rural population possessed radio, and nearly one-third of farmers had TV and fixed phone line.

However, very few possessed cellular phones (9 per cent), with no one had Computer and internet facility in three villages. More than half of the households (56 per cent) were not connected with electricity. Very few numbers of students and degree holders are aware (6 per cent) and also used the internet (3 per cent), that too, occasionally. Among ICTs, Radio was widely possessed (80 per cent) and used for getting agricultural information [13]. Farmers were also asked to express their preference for ICT for getting farm information, majority of the farmers preferred Computer with internet (88 Percent), Radio (84 Percent), and Television (76 percent). In contrast to this, only four farmers (16 percent) preferred information through Telephone [9].

3.3. e-Arik: Application Description

Based on the farmers need assessment and ICT preference findings, the e-Arik-Village Knowledge Centre was established with Computer, internet facility,

printer, scanner, Phone, TV, at Yagrung village. Project facilitators (Agricultural professionals, computer instructor and farmer facilitators) were appointed at the centre to assist the farmers to get access to the farm information by the ICTs. All time farmers query resolution and expert consultation mechanism established through computer based internet and e-mail, web camera, information by website, offline CDs, Digital library, TV, Radio and face to face personal communication methods. The e-Arik research project staff regularly undertook field visits to facilitate sustainable agricultural practices, observe crop condition, diagnosis the pest, diseases, and nutrient deficiency, physiological problems, and then field crop condition digitally documented. To solve complex crop pest, diseases, nutrient deficiency and physiological problems digitally documented and communicated to the experts at the e-Arik Research laboratory at the Central Agricultural University.

Problems were analyzed by the experts and recommendations were passed on to the e-Arik village knowledge centre by e-mail and than to the concerned farmers by phone/ personal face-face communication by the farmer facilitators. Further, farm scientists undertook need based field visits and provided expert advice to the farmers. Project portal (www.earik.in) provides information on crop cultivation aspects, agriculture and rural developmental departments (Information on objectives, mandate, thrust areas, administrative & technical personnel details, their area of expertise and contact details of the departments of Agriculture, Horticulture, Fisheries, Animal Husbandry & Veterinary, Dairy, District Rural Developmental Agency) and their schemes (through these departments Central & State governments use to implement different farmer welfare programmes), day to day market information and weather condition. Innovative approaches such as; farmer to farmer communication, local leadership and self-help group approaches were employed for the agricultural information dissemination.

4. INNOVATIONS

4.1. Farmer to Farmer Communication

Arunachal Pradesh state has large number of tribal dialects are in use. In the project area, farmers speak Adi tribal dialect. Hence, to overcome language barrier, educated farm youth selected and trained to communicate among the farmers in their local dialect as a "farmer-to-farmer communication approach" and they were designated as a "farmer facilitators". The trained farm youth also act as a "Local Knowledge managers"/ "Para Extension Professionals" in facilitating 6climate smart agriculture practices among tribal farmers. The local educated farm youth had more communication credibility and trust worthiness among local tribal farmers. Farm youth used digital cameras and camera enabled mobile phones for the digital documentation of the field condition, diseases and pest problems and same passed at the e-Arik village knowledge centre for recommendation or further transmission to the experts. The farmer facilitators were paid nominal pay of Rs. 3000 (USD 60) per month for their project work.

4.2. Message & Its Treatment

Selection of appropriate technical message and its treatment by using variety of ICT tools and combined with conventional extension methods facilitated effective communication among the tribal farmers. For example, complex technologies videos were screened and were also demonstrated at the farmers' field. For awareness creation, Radio and farmers facilitators were used. For introducing new technology, experts from the Central Agricultural University visited the villages followed by farmers; field demonstration and then video on adopted farmers & their experience case studies used for further dissemination.

4.3 Farmer Specific Information

Farmer Specific Information: Compare to conventional extension systems' blanket recom-

mendations, farmer specific information by the e-Arik project, adoption rate of disseminated farm practices and clientele satisfaction was considerably high. For example, 44 per cent and 92 per cent of farmers implemented the information on climate smart farm practices on Paddy (Oriza sativa) and Khasi Mandarin (Citrus reticulata) crops, respectively received through e-Arik system.

4.4 Partnership

Along with the project team, convergence of other agricultural advisory service providers' such as; farm science centre and developmental departments proved successful. For example, indigenous pest and diseases management measures were documented by the farmer facilitators and popularized by the Subject Matter Specialist of farm Science centers by using ICT facilities at the e-Arik village knowledge centre.

4.5 Media Mix & Reinforcement

The e-Arik project tried to integrate village knowledge centre concept with all possible ICTs like; computer with internet, telephone, mobile, radio, TV, Multimedia CDs, and traditional extension approaches. Considering, frequent outages of power and internet, to minimize farmers' disappointment and also to add value to their waiting time, the e-Arik centre had "Village library" with the publications having the information on climate smart farm practices and other scientific cultivation methods. For climate education and awareness, TV was used. The "farmer participatory video" at the e-Arik centre regularly reinforced farmers learning. Display of "organic farm inputs" at e-Arik centre created lot of interest and awareness among the tribal farmers on organic agriculture, because visitors record at the of e-Arik village knowledge centre indicated that 90 per cent of the farmers visited had a glance and raised enquiry about the availability of the products. Farmers also suggested having an outlet for organic inputs at the e-Arik village knowledge centre.

5. IMPACT

5.1 Adoption of Sustainable Farm Practices

44 per cent and 92 per cent of farmers implemented the information on sustainable farm practices on Paddy (Oriza sativa) and Khasi Mandarin (Citrus reticulata) crops, respectively received through e-Arik system [14]. After two years of project initiation, fifty five per cent of farmers developed new Khasi mandarin orchards in their Jhum field, which means they are permanently moving from age old Slash and burn agriculture to settled cultivation. Low methane emitting and water conserving technology such as System of Rice Intensification (SRI) was introduced and among forty trained farmers only two farmers were adopted in the year 2010. It may take few more years to convince more farmers to adopt, because it follows entirely different farm practice compare to their usual cultivation method followed over the generations. Forty-two per cent and 29 per cent of e-Arik beneficiaries reported increased production of Rice and Khasi mandarin crops, respectively.

5.2 Farmers' Income Increase

An average Rs. 1689 (USD 37.50) and Rs. 5251 (USD 117) per farmer per season increased income was reported in of Rice and Khasi mandarin crops among 500 e-Arik beneficiaries.

5.3 Cost and Time Savings

Transport charge of Rs. 2400 (USD 53) to avail extension services was saved by per farmer per year (Energy saving: 48 liters of Petrol as a fuel to their vehicle to reach agricultural department to get advice/ information was saved

by each farmer) and to provide farm advisory services, 3.6 times reduced expenditure was incurred in comparison with the conventional extension system [15]. Sixteen fold less time required for availing the services by the farmers and three fold less time required to deliver the services to the farmers compared to conventional extension system.

5.4 Facilitating for Sustainable Farm Practices   & Settled Cultivation

The project facilitated adoption of sustainable farm technologies such as; Vermi-compost, using legumes for nitrogen fixation, bunds and ridges for water retention, stone contour bunds, agro-forestry, indigenous pest & diseases control measures, crop rotation, indigenous pest and diseases management, introducing water conserving technologies (System of Rice Intensification), creating awareness to change Jhum to settled cultivation by Rubber plantations and Khasi mandarin orchards. After three years of project initiation, fifty five per cent of farmers developed new Khasi mandarin orchards in their Jhum field (Continuance of age old Jhum cultivation or Slash and Burn Agriculture) with reduced Jhum cycle makes large scale deforestation and unfavourable environmental impact), which means they are permanently moving from age old Slash and burn agriculture to settled cultivation.

5.5 Farmers' Willingness to Pay

A survey among e-Arik services availing farmers were indicated that the majority of the farmers (66 per cent) willing to pay only nominal fee ranging from 1to 3 USD per crop season. However, 34 per cent of the farmers not willing to pay for the services received through e-Arik. Because, they felt that agricultural advisory services are the responsibility of public sector and services are "public goods" and hence, they were not willing to pay and but they (100 per cent) desired to continuance of availing the e-Arik service [16]. At the same time, farmers also suggested to have organic farm input unit at the e-Arik village knowledge centre as a business model.

5.6 Developing Local Knowledge Managers

Due to the prevalence of tribal dialect, communication process becomes difficult task for the developmental professionals those who are not familiar with the tribal dialect. Hence, To overcome communication difficulty and also to motivate rural farm youth and others to take-up profitable farming activities, educated four tribal farm youth were used as a "farmer facilitators" along with the ICTs. Four educated farm youth were given advanced farm technological training at the constituent college of Central Agricultural University (CAU) and Farm Science Centre (Krishi Vigyan Kendra-KVK). The farm youth helped to create general agricultural and rural development awareness among tribal farmers, facilitated eco-friendly and sustainable farm technology dissemination, developed vocational efficiency among farmers, formed farmers groups for self help, facilitated use of local resources, helped to make timely decision by the farmers themselves and suggested alternative ways to solve farming and other rural problems in twelve selected villages. Even after the completion of the project, trained farm youth acting as a link between agricultural development departments and tribal farmers for facilitating advanced farm trainings and advisory services and they become "local knowledge managers" to foster the agricultural development in the remote tribal villages.

6. CONCLUSION CUM DIS-CUSSION

There was lack of availability of need based content. It is observed that among Adi tribes, farmers were adopting climate smart practices over the generations, as an indigenous knowledge. Further, local innovations to mitigate adverse effects of climate change are abundant which are needed to be slightly refined and disseminated by the ICTs. For example, best climate smart practices need to be documented digitally and same may be made available to others farmers those who are not practicing. Adi tribal farmers use to control citrus trunk borer by inserting pointed bamboo sticks, indigenous rat control technique at Paddy field, and legume tree based agro-forestry systems are some examples to disseminate among other farmers by ICTs. An experience from the project indicates that facilitating information exchange by the ICTs alone won't bring desirable changes in adopting sustainable farm practices.

And hence, appropriate technologies need to be demonstrated at farmers' field conditions for the better understanding of the tribal farmers. For example, to disseminate bio-fertilizer based seed treatment (the practice not known to the farmers in the project area), at least for the first time, practice should be demonstrated at the field among interested farmers and after the adoption of few farmers, and same practice can be disseminated by ICTs. Information and knowledge on farm practices along with other forward (farm machinery, manure, seeds) and backward linkages (Post harvest technology and market) were essential in adopting farm practices.
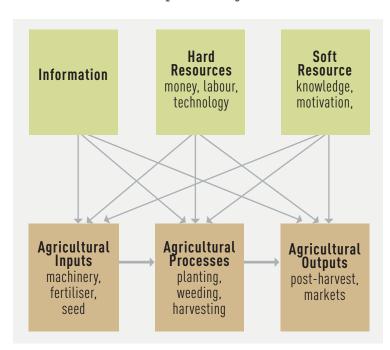
Provision needs to be more holistic in two ways (see Figure 4). First, the project must find a way to deliver all the resources necessary to turn information into agricultural action [17]. For successful implementation of the ICT project and also for its sustainability, integration of the other public (Department of Agriculture, Horticulture, Fisheries, Krishi Vigyan Kendras (Farm Science Centres) and private knowledge providers (Agriculture based NGOs, farm input dealers, agribusiness firms) in the agriculture sector creates synergy and complementary effect in disseminating sustainable farm practices. For example, the e-Arik project had collaboration with the Farm Science Centres (Krishi Vigyan Kendra) for the dissemination of Composite Fish

Figure 01: Holistic Provision on e-Agricultural Adaptation Projects

culture technology, which proved successful in establishing model fish farmers in the 10 villages of the project area. The Farm Science Centres also used ICT facilities of the e-Arik village knowledge centre for their farmers' training and other extension programmes.

7. ACKNOWLEDGMENTS

8. Glossary

■ e-Arik : Arik means agriculture in the Adi tribal dialect of Arunachal Pradesh State of North-East India. Hence, e-Arik means e-Agriculture.

■ e-Agriculture: Refers to the use of ICTs by the farmers, other rural people and farm stakeholders for information exchange, communication and learning processes, which is useful for the better management of their agricultural systems and livelihoods (www.e-agriculture.org).

■ Adi: The Adi, is one of the major tribe living in the eastern Himalayan hills and they are found in the sub-tropical regions within the districts of East Siang, Upper Siang, West Siang and Dibang Valley Districts of the Arunachal Pradesh State of North-East India. The literal meaning of Adi is "hill" or "mountain top" [10].

■ Kebang: The well organised village council of the Adi tribes is called Kebang, which administers the village affairs, manages and conducts day-to-day problems of the village. Regulates, formulates laws and issue ordinances for the well-being of the society. The Kebang was formed naturally. The village elders become naturally become village Kebang members.

The Kebang is a Democratic institution and Adi tribals are traditionally republican democratic and socialists in aspiration. The Kebang does not rule out capitalistic economy, however, at the same time, they attach importance to the sociologistic ideology. Equality in distribution of wealth and opportunities are on their cards [11].

■ Jhum Cultivation: It is a tribal traditional cultivation system involves slashing and burning of the vegetation on hill slopes and using the land for cultivation for two or three years. Then farmers move to new area for doing the same practice. In recent years, the Jhum cycle interval is reduced to two to three years (Earlier days it was seven to eight years of Jhum cycle), the farmers return to the same area for doing shifting cultivation [9].

■ Climate-Smart Agriculture: Agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances achievement of national food security and development goals [18]. END

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RE-FRAMING ICT4D:
STATUS QUO
AND PROBLEM AREAS

by Kartikeya Bajpai, India

Information and Communication Technologies have been posited as having the potential to induce a transformative effect in the field of Development. Over the last decade, the interdisciplinary field of Information and Communication Technologies for Development (ICT4D) has come together to provide a distinct contribution to the spaces where ICTs and Development overlap. However, the reach and effectiveness of these efforts have largely been contentious. This review paper draws out the status quo of ICT4D research and practice. The historical, theoretical, methodological and ethical issues which constitute the problem areas facing the field are addressed and represented in the form of alternative frames. Lastly, the author presents a set of recommendations, with the hope of provoking wider discussion in the research community, on the theme of increasing the inclusiveness and effectiveness of ICT4D research and practice.

1. INTRODUCTION

In an era where technology is pervasive in all arenas [1] of human activity, the value of technology driven development would seem intuitive to most people. However, if the evidence of the last few decades is anything to go by, the best laid plans of the development community have not lived up their egalitarian goals. The distribution of ICT resources and users is disproportionately skewed in favor of the upper, middle and high income nations. The relationship between ICTs and economic growth has proved to be contentious [2-4]. Even the basic premise of investing in ICTs as opposed to basic needs such as food, health and water continues to be debated [5]. A large number of development projects explicitly by the definition of their goals or implicitly by the nature of their activity are directed towards the Bottom of the Pyramid (BOP) [6, 7].

This paper concerns itself with a specific subset of these projects, which are concerned with the role of Information and Communication Technologies (ICTs) in the achievement of Developmental goals. In the research literature, these efforts have been grouped under umbrella terms such as "Development Informatics" and

"Information and Communication Technologies and Development". As with any development research endeavor, multidisciplinarity is an unavoidable and welcome lens to view this diverse body of work which draws upon studies from economics, information science, sociology, development studies, migration studies, computer science and agriculture, amongst many other disciplines. *There are two objectives which drive this review:*

(1) To demonstrate that in spite of the egalitarian goals and relatively innovative methodologies at play in the ICT4D community, developmental impacts are limited in similar ways to extant mainstream development projects and paradigms.

(2) To identify problem areas within the literature and, to suggest future research directions and framing alternatives.

2. MOTIVATION

This review is motivated with our experience with the non-profit sector and reading of the ICT4D literature. A large number of proposals, reports and research studies in the development sector (including this review) begin with allusions towards the "poorest of poor". However, most research and practice appears to achieve breadth in terms of inclusiveness instead of depth. The gap between proposal and execution is a characteristic that some consider rampant in the development sector at large [8]. A hypothetical technology intervention may provide previously unavailable services to rural areas, however, within these rural regions the coverage mirrors the inequities already present. For example, introduction of telecenters in rural India was observed to have reinforced and perhaps even strengthened existing socio-economic inequities [9-11]. Extending the focus of projects and their analysis to be inclusive of "depth", poses a problem to the ICT4D community that has not been adequately addressed in the literature. Secondly, while there has been a move away from the view of technol-

ogy as a "a-contextual resource with universal value" [12], as well as a large number of works highlighting the importance of socio-cultural contexts [13-16], there is no consensus on how the challenges inherent in designing, implementing and evaluating contextually aware and appropriate ICT4D projects can be overcome. Disciplines such as Communications Studies, Sociology, Development Studies, Demography and Anthropology have grappled with these issues with varying degrees of success, however, the a-theoretical nature of the current ICT4D discourse does not overtly lend itself to or borrow from these

valuable and well-honed schools of thought. These are weighty issues which can perhaps only be resolved by introspective debate within the ICT4D community. We would like to think of this review as an attempt at provoking discussion, as well as defining the discursive terrain for the same.

Scope and Boundaries

We adhere in our selections to three of the four characteristics unifying ICTD literature as identified by Burrell et al. [17]:

■ A focus on the interplay between society and technology, with an emphasis on socio-economic advancement.

■ The researcher as an "outsider" [18] to the setting under study. Typically these projects are based in the developing world and involve interdisciplinary foci.

■ A combination of studies observing the interactions between society and technology, as well as intervention efforts aimed at inducing specific socio-economic outcomes.

As mentioned earlier, ICT4D involves scholarship from a multitude of disciplines and a variety of philosophical foundations. We draw from both disciplinary as well as interdisciplinary research, with the caveat that the work must have experienced the rigors of peer review (books, chapters and, journal and

conference papers). Lastly, purely technical works (which represent what Orlikowski et al. [19] refer to as the "computational view of technology") have been excluded.

3. ICT4D BACKGROUND

We begin the background section with a subsection, which deals with some of definitional particulars which need to be delineated before any discussion lying at the intersection of the ICT4D community, the focus of this review and critical spaces can begin. Subsequently, we provide a brief phase based account of the growth of the field, for its origins still cast long shadows over its future prospects.

3.1 Definitions
3.1.1 Alphabet Soup

The body of literature under scrutiny is abundant with acronyms, with terms such as Human Computer Interaction for Development (HCI4D), Information and Communication Technologies and Development (ICTD), Information Technology for Development (ICT4D), Information Technology and International Development (ITID) and Design for Development (DfD) jostling for prominence. Ho et al. [20] delineate the various disciplinary bounds which places ICTD as the parent field which encompasses all the research that deals with "ICTs in developing countries". In addition, their model places ICT for Development as a sub-field which "deals with the challenges of designing, developing, and sustaining ICT systems that are suitable for the conditions in developing regions". Lastly, Ho et al. place HCI4D as a subfield of ICTD which covers all the HCI research concerned with the needs and challenges of developing countries and their citizens.

For the purposes of this review, we employ a barebones interpretation of ICT4D which includes all research and practice which involves the use of information and communication technologies (in any way, shape

or form) and how these affect the peoples of developing nations in "meeting their fundamental needs, achieving their basic rights" [21] and fulfilling their aspirations.

3.1.2 Digital Divide

The digital divide is a concept which constitutes the framing for a number of scholarly works in the ICT4D community and a conceptual definition is de rigueur in our review. The dominant conceptions in the literature concern themselves with the information poverty in general and the internet in particular. Norris [22] delineates three categories of the digital divide (a) the global divide between the higher income nations and developing nations (b) the social divide inherent in individual nations and, (c) the democratic divide which has connotations with regards to civic participation. For the purposes of our review we limit ourselves with the social divide which marks the gap between the information haves and have-nots within nations and regions, and what Castells"s refers to as "stepped-up inequality, polarization and social exclusion" (Castells in [23]) Our stance is similar to the one taken by Wilson and Burkett [24, 25] which seeks to underplay the catch-up type discourse common in development rhetoric, while we acknowledge the existence of north-south inequities we believe that it is micro level differences within countries that are of greater import. Also, we do not limit ourselves to internet- centric conceptualizations and consider a broader conception of ICTs, for e.g. radio, mobile telephony.

3.2 ORIGINS

As with any multi-disciplinary problem space, there is no seminal moment which marks the birth of ICT4D, its roots lie as much in a shift of focus towards technology driven development as in the exploding growth of technology and its pervasiveness in all facets of life. Richard Heeks [26] provides a phase based

account of the growth of the field which we use for its narrative affordances.

3.2.1 Post Colonial - Pre Internet

The first period of ICT4D can be conveniently bookended as beginning with a large number of the lower income nations of today gaining independence and terminating with the emergence of the internet. The application of information technology to the development of lower income countries dates back to the use of a computer by the Indian Institute of Statistics in the mid 1950's [26]. The overlap between the development agendas and ICTs predates the advent of the Internet by many a decade. This period was characterized by use of computing by governments for administrative tasks and scientific computing applications, and the increased availability of computing technology leading to adoption by corporations. The mid 1980's marked the start of the community computing model in the Scandinavian nations of Denmark, Norway and Sweden, and the start of the slow diffusion of this model to the developing world [27].

3.2.2 Internet - Millennium Development Goals

The exponential growth of internet and mobile phone users worldwide since the early 1990's has increasingly lent currency to the idea of technology driven development. The establishment of the International Development Goals in 1996 and the adoption of the subsequent formalized Millennium Development Goals of 2000 by 192 heads of state, marked an attempt to focus the divergent energies of the development sector towards shared higher level goals. The goals included reducing extreme poverty and hunger, achieving universal primary education, promoting gender equality and empowerment of women, reducing child mortality, improving maternal health, preventing the spread of HIV/AIDS, malaria, and other diseases, ensuring environmental sustainability, developing a global partner-

ship for development [28]. The Millennium Development Goals (MDGs) represent a period of paradigmatic change within the development community, in which the definition of poverty moved from the realm of the numeric to more holistic measures, in which the role of ICTs assumed greater importance [29].The overlap between the MDGs and ICTs is reinforced when we review the prominent themes emerging in the subsequent phases of ICT4D research, which range from direct applications of technology, to, assistive technologies for development.

The period from the mid-1980's to the mid-1990's can be thought of as being the era of the telecenter model in ICT4D practice and research. Telecenter projects and their public access model in its myriad variations essentially provided free access to a hub with ICTs in a public location ostensibly serving the "information poor". However, the effectiveness of public access projects is a contentious issue due to a variety of reasons [11]. First, the proliferation of commercial cybercafés in the developing world raises questions regarding the necessity of government, NGO or donor supported telecenters which some consider unsustainable as they generally do not charge users [30]. However, a section of the research community argue for public access ICTs as digital equivalents of physical libraries, providing a public service which satisfies social needs [31] which are not easily reconciled with commercial interests [32]. Second, a number of studies [9, 33] demonstrate the predominant users of public access ICTs are young, male, advantaged educationally as well as socioeconomically, with prior exposure to the Internet and not physically disabled. However, recent work [34] illustrates the importance of intermediated interactions in the developing world which suggests that primary user demographics may not be reflective of the complexities of public access ICT usage. Third, insufficient empirical work appears to have been carried out on the eventual impact of public access ICTs, with methodological difficulties being the primary hindrance [11].

3.2.3 Beyond Telecenters – Present

The proliferation of specific technology interventions beyond providing access to ICTs gave shape to what we view as the current day ICT4D movement proper, driven by active interventions and context sensitive design often accompanied by attempts at participatory methodologies. The large array of instances of ICT4D research and practice can be grouped in terms of the spotlights provided by the Millennium Development Goals, with projects focusing on diverse and overlapping domains such as microfinance [35], education[36], healthcare [37, 38], HIV/AIDS [39], agriculture [40] and the larger goal of alleviating poverty [41, 42]. The proliferation of ICT4D literature has led to the establishment of dedicated venues for researchers to present their work and interact with others in the same interest space, with conferences like the ICTD conference which is now in its fifth iteration, journals like Information Technology for Development and workshops attached to the conferences of mainstream disciplines [20].

Patra et al. [27], carried out an interesting classification of the thematic area of the papers presented at the ICT4D conference for a two year period, which brought out a surface level review of the state of the field in general, as well as the areas which seem to occupy the work (and presumably the concerns) of participants. Amongst the dominant themes, the Social Science aspects of Communications received the most attention, followed closely by Design-centric papers and papers concerned with Business aspects. While a far more comprehensive methodology would be needed to make nuanced inferences on an admittedly eclectic field, this study provides an indication of the shifting tides in the community. The focus on the business aspects of ICT4D represents the push towards sustainable development projects, while the reduced inclusion of purely technical works could be construed as a statement of intent by the community

to distance itself from disciplinary venues. The subsequent sections provide a summary of the challenges facing the field and the ICT4D status quo.

4. STATUS QUO AND PROBLEM AREAS

To address the status quo and problem areas therein, we explore four problem areas in the ICT4D community. Our belief is that the relatively older (and, ironically, more developed) development studies literature which has debated similar issues and concerns at length, has much to offer to ICT4D research and practice. However, there seems to be reluctance on the part of the ICT4D community to draw on this valuable corpus. Perhaps this can be attributed to ICT4D trying to distance itself from conventional development efforts and establish a distinct identity. Nonetheless, we believe that by ignoring the development studies literature, ICT4D is condemned to repeat some of the follies of the same. While discussing each of the themes we try to draw parallels from the development literature and attempt a comparative narrative.

4.1 Whose development is it anyway?
4.1.1 Alternative Development

In the development literature, alternative development approaches arose in reaction to the perceived shortcomings of the mainstream development discourse, which had hitherto focused on economic growth as the primary indicator of development. Alternative development emphasized "extra-economic values" which were posited to be the key to a more holistic definition of development [43]. In addition, with regards to ICTs and development, the development studies literature in the last three decades has consciously strayed away from technology issues as a reactionary measure against the technological determinism rhetoric of mainstream development agencies [24, 26]. The modernization school of development [44] is associated with the broad stroke

of technology driven development, which conceived the "third world" to be underdeveloped due to a lack of appropriate technologies and a "deficiency in knowledge [24, 45]. Consequently, approaches attributed to the modernization approach involve "technology transfer" from the "first world" to the "third world", with alleged disregard for contextual needs assessment and deployment adjustments [46]. Lastly, the early attempts of mainstream development were perceived to involve top-down communications approaches intended to modernize a "reluctant if not resistant, mass" [47]. Similar to sections of the ICT4D community, alternative development often aims to provide a more bottom-up approach to information and communication, which implies a more human-centered conception of development, which rejects notions of technology as the sole determinant. Relatively more nuanced models of society and technology, such as the social shaping of technology, and actor-network theory [48-52], are now at play in both the alternative development as well as ICT4D discourses.

4.1.2 A question of norms

The neglect of technology in development studies provides possibilities for ICT4D to generate unique insights on a theme which seems to have lost its relevance in development discourse. Also, while development theory takes upon itself the task of critiquing ICT policies, it is far less concerned with action oriented ICT and Development research [52]. In contrast, ICT4D by the nature of its name and framing belies an assumption that the introduction and use of technology in resource constrained settings has appreciable impact on developmental goals. ICT4D as a field has positioned itself in a manner which is inclusive of economic development, as demonstrated most comprehensively by Jensen [53] who delineated economic outcomes with clear caveats as to how far these results are generalisable. In addition, ICT4D also has under its purview, projects which focus on the noneconomic outcomes. However, the conundrum that faces the field is, how can projects create

comparable accounts of such an eclectic set of developmental activities. In addition, without sound impact assessment, how can it be determined to what extent an ICT4D intervention is part of the solution or part of the problem [54].

Ho et al. [20] – in their review article on HCI4D – shy away from a concrete definition of development (as does this review), for reasons of inclusiveness, but also to avoid the politicized discourse in development theory with regards to the exact dimensions of development. Although an apolitical approach is appreciable, without clarity of what counts as development and without a basis for comparison, ICT4D cannot make a convincing case for the eventual impacts of its cumulative efforts. This tendency to sidestep the particulars of the exact conception of the development intended/achieved by projects is common in the ICT4D literature [3]. In the ICT4D community, the notion of impact has cachet, as Donner et al. [55] summarize, "the "4" in ICT4D—the search for impact—remains central. We convene panels on "best practices", debate policies for their usefulness, and always, it seems, are looking for technologies or solutions that can deliver "impact" at large scales and low costs". The recent uptake of Randomized Controlled Trials (RCTs) is an encouraging sign with regards to the rigor of evaluation in the community. The proponents of alternative development have in the past undergone similar debates but have managed to evolve a few dominant conceptions of development, which with increasing adoption provide baselines for comparison.

4.1.3 Capabilities approach

In the absence of community generated normative frameworks, the ICT4D community must perhaps look to development studies for frameworks that suit its unique sensibilities and aims. We feel that ICT4D's emphasis on non-economic conceptions of development, the desire for breadth in terms of what counts for development, the need for interdisciplinary and participatory methodologies, and our own focus on individual

level analysis is best met by Amartya Sen's "capabilities approach" [56], which aims to provide a means to evaluate and assess "individual well being and social arrangements"[57]. The capabilities approach is based on two assumptions, in which capabilities represent what a person is "free to do" and functionings represent the achievement of "whatever goals or values he or she regards as important", with development conceptualized as the expansion of freedoms[58]. Sen posits five domains in which these freedoms may extend- "economic opportunities, political freedoms, social facilities, transparency guarantees and protective security" [56]. In addition, Sen's model posits that freedoms are both a means (i.e. instrumental in nature), as well as, an end (i.e. constitutive in the nature) of development. This essentially human centered development paradigm, which frames poverty as "deprivation of basic capabilities" [46], provides both the flexibility needed for addressing individual needs in varied contexts, as well as a normative frame. We believe that the increasing adoption of this approach may provide a basis for comparability of projects.

Within the ICT4D community, a number of studies have engaged [59-61] with the capabilities approach, each proposing an operational variation of Sen's original model adapted to the needs and realities of the community. Kleine [62] proposes a "choice framework" which borrows elements from the capabilities approach, as well as the "sustainable livelihoods framework", to produce a methodology which posits expansion of choices as the primary development outcome. The focus on expanding capabilities rather than functioning reflects an emphasis on choice. Ratan et al. [63] use the capabilities approach to make distinctions between welfare and agency interests and outcomes. Gigler [64] adapts the capabilities approach to generate an evaluation framework with additional dimensions added to Sen's original five dimensions, such as psychological (individual) and cultural (individual and collective). There have been some preliminary attempts of applica-

tion of the capabilities approach in ICT4D evaluation efforts. De' [65] uses the capabilities approach to inform the evaluation of an e-Governance initiative in India. Madon [66] develops an exploratory framework for the evaluation of two e-Government initiatives in India, however, there seems to be no attempts at generating a systematic methodology, rather the importance seems to be accorded to the rhetorical affordances presented by the capabilities approach as opposed to traditional evaluation methodologies.

However, the application of capabilities approach poses some difficult questions to the ICT4D community that need to be resolved before the use of such frameworks can add value. First, the "underspecific" nature of the various capabilities are to be defined stand at odds with the utilitarian approach of the ICT4D community, with Sen himself refusing to provide a definitive listing of capabilities, instead preferring that if such a list was to be created and prioritized, that it be based on consensus in the community [59, 67]. Secondly, the applications of the capabilities approach in the ICT4D literature are currently dominated by different adaptations of the original model, a nascent situation in which a consensus variant has not emerged. Third, as Heeks et al. [58] suggest, the approach may add layers of complexity, for example, capabilities must be analysed as "both inputs and outputs" to projects.

On the theme of pre-identification of ICT4D project particulars, Prakash et al. [46] suggest that the specific meaning of development attached to ICT4D projects has a significant effect on the eventual impacts, with the marginalized most at risk of being neglected further. In addition, Srinivasan [68] cautions against ICT4D interventions adopting pre-conceived developmental goals (and by logical extension invalidates the project goal evaluative framework). We sympathize with this inductive view, which stresses on not having a rigid developmental or theoretical frame which may run afoul of the realities of implementation scenarios (which in the vast majority of ICT4D projects are located re-

motely in relation to planning institutions/personnel). While we agree with the stance against pre-identified goals, we do however strongly believe that the evaluative frameworks must identify developmental outcomes through a broader lens which takes contextual unfreedoms into consideration and provides accounts in the most comparable forms possible.

4.1.4 Marginalized Populations

With regards to our focus on the subaltern, the information society discourse has emphasized the need for a move away from nation level comparisons, to inequities within regions. Castells [69] emphasizes the gap between the information rich and those peoples and regions that have been "switched off". Beck et al. [70] provide an important model for the potential of ICTs to empower marginalized groups, they posit that most marginalized populations occupy neither extremes of inclusion or exclusion and can be directed towards inclusion by the use of assistive ICTs for intermediaries (NGOs). While even mainstream agencies such as the World Bank acknowledge the importance of inclusiveness of ICT policies and projects for reaching developmental goals [71], till consensus on conceptions of what is meant by the "D" in ICT4D and how it can be measured/judged are arrived at, inclusiveness is likely to remain in the realm of buzzwords.

Walsham [72] in his review of India based ICT4D initiatives notes that a common theme is the lack of outcomes with regards to "the very poor, landless farmers, lower castes or sometimes women". This indictment is further magnified by the fact that India has been focus and location of a disproportionate number of the ICT4D literature and interventions [27], clearly, the depth of the ICT4D community's efforts has in general not reached the marginalized and the disenfranchised. However, Kleine [73] proposes that one of the pressing tasks for the ICT4D community lies in the "constant deconstructing and critically reconstructing what people mean with the term development", a view which we

believe holds some of the answers for the normative aspects of the field.

4.2 POWER, KNOWLEDGE AND PARTICIPATION

"The most fundamental issues of development are, at their core, issues of power" -(Korten, D. (in Pieterse 1998))

A number of critiques of development theory and practice concern themselves with the issue of power constructs and, in particular, with Foucauldian conceptions of power [45, 74-76]. In the development literature, this body of works has been grouped under the "post development" label whose principle critique of mainstream development was that it enforced "development" on peoples instead of engaging them [63]. In broad strokes, the "post developmentalists" can be considered to be dismissive of the notion of a "development project" itself. Foucault's notion suggests that the universalisation of Western knowledge devalues other native knowledges and that it is through the "insurrection of subjugated knowledges" that criticism serves a wider purpose [77]. Foucault speaks of the import of "the re-emergence of these low ranking knowledges, these unqualified, even directly disqualified knowledges", which tend to be devalued by paternalistic approaches to development.

The neglect of how power constructs [78] function in a particular context can lead to less than desirable development results. Sillitoe [8] describes the case of the Flood Action Plan (FAP) which aimed to address monsoon flooding in Bangladesh. Despite the impressive commitment of monetary resources, the project was considered to be a failure on multiple counts. Of these, the ramifications on the power structures at play are most relevant to our discussion. The effects of the FAP when coupled with separate fish stocking development plans led to exclusion of poor fisherman of a particular caste (i.e. with lower power) whereas previously they

were the dominant demographic in the industry. This can be considered a manifestation of the Foucauldian conception of repression and domination, an arrangement of power relations such that "they are perpetually "asymmetrical""[74]. Lastly, Rowlands' [64, 79] deconstruction of the empowerment construct along the dimensions of, "power to", "power with", "power over" and "power within", pose a difficult set of questions to the ICT4D community which is ostensibly concerned with empowerment, but has not delved into nuanced understanding and approaches to the same.

Paulo Freire's call for Participatory Action Research (PAR) marked a shift in emphasis towards people-centric methodologies which aimed to increase the inclusiveness of development efforts, has found adherents in both development studies [54, 80] as well as ICT4D [68, 81]. PAR is centered on the concept of "emancipation through dialog", and more specifically to provide means for people to be subjects rather than objects and to gain control over their own futures instead of being participants in the agendas of others. A popular variant of the participatory frame is Robert Chambers Participatory Rural Appraisal (PRA)[82] which provides a methodology which is more weighted towards lessons learned by NGOs and other development practitioners and this actionable nature has led to widespread adoption of this approach. Critics [75]of the PRA framework highlight that its group discussion based approaches neglect the power relations that silence the marginalized and disempowered and in effect provide more new ways for the voices of these populations to be silenced. The participant group in PRA is in some ways treated like a homogeneous mass which is also analogous to Spivak's critique of Foucault and Deleuze's conceptions of grouping these populations under labels such as the "masses"[83].

While participation as an approach has been co-opted by mainstream development agencies and rhetoric, its practice is rather more problematic. Edwards [54] suggests that participation has been utilized for reasons of improving efficiency of research and practice, rather than the empowerment frame on which it originates. This focus on participation as a means of improving efficacy of programs reflects a tendency towards consequentialism, with attendant connotations of oversight of process aspects. Cooke et al. [80] provide an account of the alleged "tyrannies of participation". These include the "groupthink" critique of PRA as mentioned before, a valorization of local knowledge which does not take the complexities of power constructs into consideration and a tendency towards methodological rigidness which devalues alternative approaches.

Ho et al. [20] suggest that based on Michener's categorization of participatory approaches, most ICT4D initiatives fall under the weak participation label, which involve consultation, as compared to strong participation which involves conceding control to subjects. While the import of participatory approaches is acknowledged by the ICT4D community [17], much like the question of development, participation is a tag that is used indiscriminately in much of the literature without much apparent grounding. The most promising exploration of power constructs in ICT4D implementation comes from Ratan et al. [63]who examined the welfare versus agency approaches to telecenters, providing a view of the power relations in both framing and praxis. Their findings suggest that empowering agency provides quicker returns whereas the welfare empowering approach is more diffuse and, hence, difficult to both execute as well as evaluate. Participation is a loaded term and consensus on what approaches constitute genuine participation seems unlikely to be achieved in isolation. Much like the question of what is implied by development in ICT4D, resolution rests in increasing reflexivity within the community and active debate which concerns itself with appropriate usage in discourse and practice.

4.3 The Problem with Culture

"Our kind of knowledge is simply not enough" (Paul Devitt in (Edwards 1989))

The issues of local culture and indigenous knowledge have generated positions in extremis. On the

one hand, as the Devitt quote succinctly captures, is the view that indigenous knowledges, organizational structures, institutions and innovations are vital to any development initiative [84]. In addition, critics allege that the "information poverty" frame places value on Western notions of what information is valuable and, hence, implicitly devalues the indigenous knowledges of those that have been labeled as information poor [24] On the other hand, the practical difficulties in capturing and utilizing these local knowledges with efficacy brings into question the whole premise of whether such cultural capital can be represented and used beyond a superficial level. As Sillitoe [8] suggests, indigenous knowledge "..is fragmentarily distributed, exists nowhere as a totality. Although more widely shared locally then specialized scientific knowledge, no one person, institution or authority encompasses it all. There is no grand repository and hence no coherent overall theoretical model". In such theoretically and methodologically shaky terrain, attempts at including indigenous knowledge and cultural artifacts in development initiatives stand at risk of providing reductive and simplistic representations of complexity. As Spivak suggests, that in their complexities, the subaltern is "irretrievably heterogeneous" [83] and perhaps "non-narrativisable" [85].

In the ICT4D community, local cultures are generally taken into consideration at the exploratory and evaluative phases. The work on game based education by Kam et al. [36] represents one of the more rigorous attempts at incorporating local culture in a technology intervention initiative. Dias et al. [86] recount that the Kam et al. study over a four year period, involved the evaluation of 35 pre-existing games with the target demographic, creation of 10 prototype games to be tested with rural students, exploration and evaluation of 28 local games, design of new games and the evaluation of the same. The iterative methodology employed represents a nuanced effort at avoiding enforcing conceptions of games on a rural populace. However, the extended period and efforts of the project will likely be limited

to this particular population and application domain. Were another ICT4D project in another application domain to target the same population, their cultural representations would have to be inductively and iteratively be explored yet again, hence, the lack of repositories/documentation of how ICT4D projects represent local cultures, compel every intervention to start from the ground up.

The lack of repositories also act against the aims of the community to be transparent, and although the proof of the pudding may be in the eating, project results may not be accurate reflections of how the cultural sensibilities of the local populace were engaged. Also, many developing nations exhibit tremendous heterogeneity in terms of culture, language and institutions, for instance, India has 22 official languages and innumerable dialects for each of the same. Attempts at incorporating ethereal linguistic variants such as Hinglish [87] face significant design challenges. Notions of scalability could then be considered at odds with projects which aim to provide high cultural specificity. Lastly, the "proof of concept" nature of most ICT4D initiatives allows the community to sidestep important questions such as sustainability and scalability of extant attempts at incorporating local cultures and knowledges in projects.

4.4 Theory and Methods

"Philosophers have only interpreted the world in different ways. The point is, however, to change it." – Karl Marx

Marx's dictum captures the spirit of the ICT4D literature, which focuses on action orientations and implies a less than active engagement with theoretical constructs. As with any such positional binaries, the ideal lies somewhere in the middle, a frame involving synchronous understanding and action [54]. While there are numerous examples of exploratory research preceding active intervention as discussed in our exemplar section, the pre-dominant methodological process

at play is evaluation heavy, i.e. understanding after doing. While this is in accordance with the emphasis on impact assessment in the community, the lack of theoretical constructs has provoked active debate in the community [17, 88, 89]. In another parallel to the alternative development literature, the "open ended" [43] nature of ICT4D"s theoretical and methodological grounding provides avenues for flexibility, a lack of rigidness which supports the "in the field" modifications and adaptations which are inevitable when project design/planning is largely done by "outsiders" who are located remotely to sites.

Also, Berger [90] posits that over adherence to theoretical frames may create situations where "empirical relationships are treated as manifestations of the theoretical". The abundant diversity of contexts in developing countries also makes the creation and application of a grand theory inherently complex. Burrell et al. [17] provide the argument made by Dourish [91]with regards to the ubiquity of "implications for design" in the CSCW literature, to make a case against dogmatic research and the danger of producing "cookie-cutter studies". Since hypotheses are generally generated after the fact in development research [82], rigid community norms may perhaps not be desirable or practical.

Proponents [43] of "grand" or "meta" theories however suggest that without theoretical grounding underlying causes of underdevelopment may not be addressed, hence, ICT4D initiatives face the danger of addressing symptoms rather than causes. There also seems to be a dominant view within the community itself that ICT4D research has not been methodologically vigorous [27]. The core of the problems facing the community stems from the dual layers of complexity of most its initiatives, ICT4D grapples with notions of being interdisciplinary, as well as, cross cultural in practice. Also, the "proof of concept" nature of the bulk of ICT4D, which leads to a proliferation of pilot stud-

ies, highlights an underlying tension with regards to methodological breadth and depth. As Sillitoe [8] with regards to alternative development, "We are attempting to develop a methodology midway between the long-term anthropological fieldwork necessary to obtain in-depth cultural insights and more rapid techniques which cannot fully engage the entirety of local knowledge within its socio-cultural context".

These methodological "third ways" present community level problems of standards, for they cannot fairly be judged either by the standards of the parent discipline of a particular methodology (for they shall always fall short of these), nor can they be judged by the standards of non-research based development practice which concern themselves with rapidity. Burrell et al. [17] suggest that each methodology be judged by means of consensus of relevant "groupings" of the ICT4D community. However, this can only be interpreted as a stopgap solution, for ICT4D is already criticized as having "fragmented approaches" [92]. If solutions regarding methodological rigorousness are to be treated in isolation, much like alternative development, it could potentially lead to the intellectual segmentation of the community. In terms of methodologies, while some contexts leave no avenue other than survey based approaches, we share Mark Twain's assessment of interviews, "The Interview was not a happy invention. It is perhaps the poorest of all ways of getting at what is in a man" [93]. Critics allege that survey approaches to development interventions is another form of enforcing conceptual schemas of outsiders and to introduce meanings on communities which may not reflect realities [82], hence, this approach may undermine local knowledges. While ethnography and participant observation have also found traction in the ICT4D corpus, we feel the most promising avenue for deeper analysis lies in the reflexive analysis from usage data of intervention technol-

ogies. Contrary to other disciplines, in the case of ICT4D often the technological artifact can provide or generate data which provides scope for more-nuanced analysis [55].

The framing of ICT4D as a field which avoids dogma, theory, frameworks and paradigms, while prudent in terms of being apolitical and flexible, can only serve as a phase and not an end. For the current stasis represents a situation in which the normative basis remains undefined, (What is development? What is meant by participation? What is meant by empowerment? How is the rigorousness of ICT4D research to be judged? Does the ICT4D agency aim to develop or to assist?), remain unanswered in the hope of a future field-level consensus. While we believe meta-theories are not answer, methodological frameworks and standards are an unavoidable step towards answering some of the bigger questions.

5. DISCUSSION

The critiques of development interventions in general and ICT4D interventions in particular can largely be considered as sins of omission. First, ICT4D studies are largely framed as "proof of concept" or pilot projects [94], which implies not an active engagement in affecting development but rather demonstrating a basic level of potential of affecting development. The proof of concept frame runs counter to the idea of a long term scaled up or sustainable development interventions which may be needed to reach hard to reach and hidden populations. Also, this pilot approach limits the scope of projects in both terms of timelines as well as responsibility ("it"s just a pilot, not a panacea"). To the credit of the ICT4D community, the emphasis on assistive aspects of ICT4D rather than more deterministic approaches, promises to be amenable to Sen's conception of expanding capabilities. However, the normative aspects of the field cannot be ignored, for a field whose appellation includes "for development", the reach and sustainability

of its efforts must be of utmost importance.

Second, the ICT4D community while interdisciplinary in its framing and composition, does not appear to borrow extensively from the existing work of older disciplines, instead preferring to build constructs from the ground up. While this may hold true for some contexts more than others, for example, technologically re-inventing the wheel might be desirable whereas in social analysis it may not be, for a field which has no unifying theories or paradigms, ignoring the existing scholarship and constructs comes at its own peril. Third, by avoiding the normative aspects of discourse, ICT4D undermines the credibility of its valuable contributions. For avoiding the debates on normative issues, which may lead to a focus on project outcomes as justification, risks ignoring the aspects of capability and choice expansion.

An outcome oriented approach may ignore the multifarious socio-cultural effects of developmental interventions, which are prone to lose importance in light of the focus on a few specific chosen developmental outcomes. Fourth, by both its name and the majority of the works that comprise its corpus, ICT4D displays an orientation towards action. While such an approach is admirable in its ideology, it attempts to sidestep issues of power structures, indigenous knowledge and the cultural-institutional forces at play, in effect it risks instantiating a new form of technological determinism. While many ICT4D projects attempt to factor in these admittedly difficult issues into their design and evaluation phases, thus far these efforts have been superficial at best, for a greater engagement would require a theoretical underpinning which is currently absent. Fifth, an aspect of the ICT4D value model egregious in its absence is a basis for evaluation. Evaluations are currently limited to the specifics of each project and context (typically limited to isolated developmental outcomes), and do not provide much of a basis for comparability or generalizability. While we do not advocate for these factors to be a necessity for every study (and hence recreate the "implications for design" stasis), consensus must be reached on

evaluative norms before these isolated pieces can form a theoretical and methodological whole. Without rigorous evaluative methodologies, ICT4D perhaps lacks a credible justification for introducing such interventions in regions where power constructs might inhibit people from refusing, questioning and complaining. We believe that the adoption of a broad developmental frame such as the Capabilities approach may help situate ICT4D research and practice in terms of the needs and aspirations of those that have hitherto been excluded.

6. CONCLUSION

ICT4D as a field is currently in a nascent stage, which offers exciting possibilities and daunting challenges. From the perspective of hidden and hard to reach populations, ICT4D implicitly promises to provide greater penetration of development efforts and rapid expansion of individual capabilities. There is justifiable excitement in the development community with regards to the potentially transformative effect of ICTs in domains such as Agriculture, Education, Health, Finance and Governance.

The current narrative of the ICT4D community does not do justice to the inherent complexities of such interventions, which, as we have observed at many points in this review, combine in their various ways and forms to result in the continued or strengthened lack of reach to the disenfranchised and marginalized. We believe that some of these issues are those concerned with documentation practices. For instance, ICT4D initiatives manage to carry out complex interventions in socio-economically and politically sensitive areas, however, these aspects of the research process are not generally reported, in effect, recreating notions of "anti-politics" [95], where development problems are largely framed as apolitical technical problems. After a delineation of the basic concepts at play and the origins of the field (for what's past is prologue), we discuss the methodological, theoretical and contextual issues of the field.

Subsequently, we describe the status quo in the field and the relevant problem areas in this domain. We provide four themes in terms of problem areas, which form the heart of our argument, namely, the lack of a normative basis in the community, neglect of power/knowledge constructs in ICT4D interventions, the difficulties and ethics of capturing and representing indigenous knowledge and local cultures and, lastly, the theoretical and methodological issues that face the community.

Our major recommendations are as follows:

■ Our first recommendation is for the community to engage with operationalisations of Amartya Sen's "Capability Framework", as an alternative normative frame to fit the unique space that ICT4D occupies in the context of development and technology literatures. As a starting point, we advocate for the adoption of Sen's conception [56] of a "supplementary" approach to the inclusion of the capabilities framework, i.e. capability considerations being used as a supplementary consideration to traditional approaches. We believe that with wide application and the generation of exemplar of the approach in action within a multitude of contexts, a number of problem areas can be addressed in a bottom up manner. First, the use of such a validated approach can help with establishing normative basis of scholarship and practice of ICT4D. Second, the capability approach could help increase the scope for generalisability and comparability (at the interpersonal level) of ICT4D projects. Third, the adoption of Sen's approach allows for the conceptualization of individual level developmental effects and can alleviate the current neglect of hidden and hard to reach populations. Fourth, the use of a approach that has gained acceptance in the development studies literature and practice could possibly help act as a bridge to a parallel but separate community.

■ Our second recommendation concerns itself with power/knowledge issues. We believe that greater attention needs to be paid to the power constructs of lo-

cal contexts in ICT4D interventions. In addition, new methodologies need to be developed to systematically include indigenous knowledge, culture and priorities in project design, implementation and evaluation. While participation is posited to be the answer to these weighty issues, the current handling of participation as a concept and in methodologies leaves much to be desired. The ICT4D community needs to ensure that its own priorities and conceptualizations of what constitutes knowledge, "valuable information" and development do not devalue or ignore local counterparts.

We believe that greater use of data generated by the artifacts themselves, when used with methodologies such as ethnography & participatory design (with strong instantiations of shared access/control with participants) can lead to fairer and more relevant ICT4D projects. Concordantly, we advocate, for lesser reliance on survey based methodologies which are liable to be "outsider" centric in their design. Also, we recommend that projects move beyond the "achievement of project goals as development" frame and attempt to situate their results in the constructs broader than the project level (with clear caveats regarding the extent of generalisability possible).

■ Our third recommendation deals with self-reflexivity within the community with regards to how various research personnel and institutional attributes involved in a particular ICT4D initiative affect the framing, execution and evaluation of projects, in essence, a transparency norm. In addition, we advocate for stricter (albeit not rigid) norms with regards to the framing of ICT4D projects to address the "proposal versus reality" gap currently prevalent in the field. Sherry Turkle, in an entirely different context [96], states that, "when objects are lost, subjects are found", a piece of advice which may hold the ICT4D in good stead in their search for impact and inclusiveness. END

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Note of Thanks from the 5TH IFIP WITFOR Secretariat

The 5th IFIP WITFOR 2012 Secretariat wishes to thank all of you for helping make the 5th IFIP WITFOR 2012 a successful milestone on the road to leveraging ICT for sustainable progress. We deeply appreciate the support from and contributions made by:

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The 6th IFIP WITFOR 2013 will be held in Asuncion, Paraguay and we wish WITFOR the very best for setting new benchmarks in its journey to assess and enable technology's growing contribution to sustainable human development.

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