IFIP WITFOR 2007

ICT for Development and Prosperity

Edited by

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Preface

Paying special attention to the needs of the developing countries and assisting them to derive optimal benefits from the application of Information and Communication technologies is one of the key elements of the mission of the International Federation for Information Processing (IFIP). This has been reaffirmed in IFIP's decision in 2007 to make promoting digital equity as one of its strategic goals along with a resolve to create a global platform to move in that direction, by:

- Promoting practical demonstrator projects,
- Contributing to sharing knowledge and experiences e.g. through a series of conferences,
- Encouraging sharing of knowledge through appropriate access to relevant ICT literature.

The World IT Forum (WITFOR) is one of the more visible representations of this goal of IFIP. Recognizing the developmental opportunities offered by digital technologies and the need for the developing and the developed countries to collaborate to harness the potential of such opportunities, WITFOR is organized in close cooperation with the governments of the host countries and local communities, including national computer societies.

WITFOR aims at examining different initiatives on effective, context sensitive development and use of ICT and its applications, access to relevant information, and the development of "fair use principles". In particular, the WITFOR events are intended to:

- Help put ICT-enabled development initiatives on the agenda of different organizations, governmental bodies, and groups currently involved in information and communications technologies.
- Work with various groups to help put ICT diffusion and sustainable effective use on the agenda of senior policy makers and political leaders.
- Assist international organizations and donor agencies to incorporate issues of the diffusion of ICTs and access to information into loan and funding programs with adequate financial and institutional allocations.
- Be more pro-active in using new technologies explicitly to reduce existing social tensions and conflicts.
- Encourage scholars, analysts and researchers to put the issue of electronic equity higher on their research agendas.
- To listen to and learn from colleagues around the world about their unique concerns over access to technology.
• Develop guidelines on these issues and advise governments, to formulate and follow the best strategy for the use of ICT in order to achieve global ICT-equity.

WITFOR has been contributing to taking the World Summit on the Information Society’s (WSIS) Plan of Action a step forward and to helping developing countries to achieve the UN Millennium Development Goals (MDGs). WITFOR investigates successful, sustainable ICT strategies in developing countries and examines different initiatives and projects on effective, context sensitive development and use of ICT applications. This work is conducted in eight thematic commissions and the result of this preparatory work is presented as policies, initiatives and best practices every second year in the conference.

The first WITFOR took place in 2003 in Vilnius, Lithuania and the second one in 2005 in Gaborone, Botswana. Both events concluded with a declaration (included in this volume as annexes). We deliberately did not seek to produce another declaration in 2007 as a result of the third WITFOR in Addis Ababa, Ethiopia, but we wanted to build upon both the Vilnius and Gaborone Declarations and to take the conference a step further. We feel that WITFOR 2007 has succeeded in this goal.

WITFOR 2007 was a big success. About 1250 registered participants from more than 60 countries and 140 speakers from 45 countries kept the convention centre of the UN Economic Commission for Africa (ECA) abuzz for three days. Its success goes beyond the numbers, however. The concept of WITFOR is to bring together politicians, policymakers, researchers and practitioners from developed, emerging and developing countries with the aim of discussing together ICT policies and practical experiences. This mix was well represented at Addis Ababa. With the presence of many high level delegates from government, academia and research organisations and other experts in the field, the conference venue was brimming with lively meetings alongside various sessions throughout the three days.

H.E. Mr. Meles Zenawi, Prime Minister of Ethiopia, in his opening speech underlined the importance of WITFOR for a country like Ethiopia. Bridging the ICT gap and ensuring an optimal and innovative use of ICT tools will be a decisive factor for the successful implementation of development strategies, the Prime Minister said. Following the impressive opening speech, the plenary sessions addressed issues such as major development programs ranging from the One Laptop Per Child initiative of Nicholas Negroponte to the programs of the African Development Bank. The role of international organizations such as the UN Global Alliance for ICT and Development
(UN-GAID), UNESCO, ITU, UN ECA and IFIP was discussed, as were practical experiences with national ICT policies from Zambia, Ethiopia, China, Vietnam, Brazil and Tunisia. A panel discussion was organized on the issue of human resource capacity building where, among others, the IFIP Professionalism Project was presented. To underscore the main theme of the conference, the role of ICT industry with respect to development and prosperity, eight commissions took care of the parallel sessions with more than one hundred speakers on Agriculture, Building the Infrastructure, Economic Opportunities, Education, Empowerment & Participation, Environment, Health and Social, Ethical & Legal Aspects. Recognising just some of the speakers would not do justice to others and keeping this foreword brief, we have included the full, final program as an annex.

Thanks to the huge efforts and amounts of time of the many people involved in the eight commissions, in the national organizing committee and its subcommittees, the WITFOR Secretariat, the Ethiopian IT Professionals Association (the Ethiopian member society of IFIP), the Ethiopian ICT Development Agency, Addis Ababa University and many more, we can look back at a great event and we can look forward to many follow up activities and to WITFOR 2009.

We realize that despite the success of the three WITFORs so far, there is still a long way to go and much to be achieved. We are confident, however, that the enthusiasm and high level of active participation will only increase in the coming years. The challenge will be to not only work on the WITFOR conference itself, but to expand the number of people and organizations involved and to start initiatives in the WITFOR spirit on different scales in various countries and regions. As WITFOR moves around the world, the momentum gained in one continent should not get lost when the WITFOR moves to the next stop in its journey.

Finally, as editors of this volume, we sincerely thank the contributors to this book for their commitment and painstaking work to make it possible. This is only a small but a valuable evidence of the work done by the WITFOR commissions. It must be borne in mind that the contributions were written before the conference took place because we aimed at having the book ready at the start of WITFOR. Due to unforeseen circumstances this was not possible. Rather than delaying the publication further by revising the contributions as post-conference chapters, we decided to go by the original contributions.

November 2007
Satish Jha / Leon Strous
Welcome

KEYNOTE ADDRESS
H.E. ATO MELES ZENAWI, PRIME MINISTER
FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

Mr. Chairperson,

Excellencies Ministers in charge of Information and
Communication Technology,

Heads of Delegation,
Distinguished Participants,
Ladies and Gentlemen,

I would like, once again, to welcome you all to Addis Ababa for the Third World Information Technology Forum. Ethiopia draws enormous satisfaction from hosting this important global gathering. Organized in collaboration with the International Federation for Information Processing, it brings together stakeholders in the ICT field from across the globe.

Excellencies,
Distinguished Participants,

The choice of the theme of your forum "ICT for Development and Prosperity" could hardly have come at a more fitting time. ICT tools are playing an increasingly important role in the attainment of development objectives.

The ability to create, share and act on information from the myriad of internal and external sources now available can help manufacturers and service providers compete more effectively and operate more efficiently in this rapidly changing global context.

The critical factor for success in this environment is people. Only people have the agility and capacity to identify and act on new information, and the flexibility to meet challenges and capitalize on new opportunities.
By surrounding people with powerful tools and the right culture, providers of ICT amplify their ability to adapt more rapidly to the challenges of development.

In this day and age, globalization, connectivity, and demographics are shaping the landscape for ICT manufacturers and service providers. The beneficiaries of ICT also play an essential role.

Developing countries, such as Ethiopia, are lagging behind in ICT infrastructure and in the use of ICT tools. Bridging this ICT gap and ensuring the optimal and innovative use of ICT tools will have a decisive bearing on the success or failure of development. In short, rapid progress in this area, for countries such as Ethiopia, is not a matter of choice, but of necessity.

This forum will address issues critical to developing countries, the application of ICT in fighting poverty, ensuring access to education and promoting empowerment, among others. It will, I am sure, showcase cutting-edge ICT solutions for economic development. It is appropriate that the Forum will address issues related to the social, ethical and legal consequences of ICT. This is an occasion to provide demonstrations of the best practice from around the world.

This decisive role that ICT plays in facilitating successful implementation of development objectives is clearly spelt out in the Declaration of Principles of the World Summit on Information Society. This Forum is essential in providing developing countries the opportunity for interaction and experience sharing, as well as helping cement global partnerships for development to help attain the Millennium Development Goals.

I must commend the efforts of the organizers of this meeting.

Excellencies,  
Distinguished Participants,  

The Government of Ethiopia recognizes the importance of optimizing the use of ICT tools to help reduce poverty. In this regard, we have aggressively promoted ICT as a vehicle for the realization of our Agriculture-Led Industrialization Development Policy and for the Capacity Building Program.

One such example is the Government's school-net program connecting all secondary schools in Ethiopia and enabling pupils across the country to have access to quality education through ICT tools.
Another illustration of our innovative use of ICT tools has been in the agricultural sector, specifically focusing on rural communities. Work to connect lower level administrative structures is already being pushed ahead. This is intended to enhance training for farmers in the use of improved agricultural inputs and provide timely information on markets for agricultural products.

These are only a few illustrations of how ICT tools are being integrated into our national poverty reduction strategies and how they can be utilized to advance socio-economic development objectives.

We feel that Ethiopia's efforts in this regard are encouraging. Nevertheless, the road towards ensuring adequate ICT access to all and in providing affordable access to ICT infrastructure and services for rural communities remains a daunting challenge. This difficulty stems, of course, from the fact that ICT is both knowledge-based and capital intensive.

Only through the forging of strong partnerships between all stakeholders, governments, the private sector, international agencies and the donor community, can these challenges be surmounted.

The investments required for building the necessary infrastructure, and for expanding and modernizing the education sector, are enormous. This should not, and will not, deter us from facing those challenges, for what is at stake is the future of our societies.

In light of the nexus between ICT and development, the global community as a whole is also faced with a very real danger from a growing ICT divide between developed and developing countries, that is affecting the African continent most acutely.

In a world that has become increasingly inter-dependent the exclusion, and marginalization, of vast segments of the globe from the benefits of ICT, inevitably have a negative impact both on the developed and on the developing world. In the interests of the global community, the benefits of advances in communication technology must be shared by all. Developing countries, for their part must create the enabling environment for partnership in this important area of human endeavour. No one should be left behind.
Excellencies,
Distinguished Participants,

I cannot fail in conclusion to mention the significance of the convening of this Forum on the eve of the Ethiopian Millennium. While this is an occasion for us Ethiopians to reflect on our past performance, and on the challenges ahead, it is clear the success of our efforts to extricate ourselves from poverty will depend, to a large extent, on our achievements in the ICT field.

I wish you all successful deliberations and a pleasant stay in Addis Ababa.

I Thank You!
Contributions

WITFOR is not a typical academic conference with strictly refereed scientific papers. The presentations made at the conference are drawn from a variety of experiences ranging from the grass roots level to the academic. Contributions to this book consist of chapters prepared by each commission during the preparatory phase for the conference itself.
1. Agriculture

Vikas Nath\textsuperscript{1}

Commission co-chairs: Vikas Nath, Peter Ballantyne\textsuperscript{2}

1.1. Introduction

There is no dispute that information and communication technologies have integrated widely into all sectors of the global economy, including transport, communications, banking, trade and commerce, entertainment and the service sector. These technologies have transformed markets, increased competitiveness and efficiency of enterprises, created new employment opportunities, and provided countries and individuals another means for economic development and to compete in the global markets. And these changes are not just restricted to developed economies, as developing countries are also trying to seize new opportunities emerging from the digital revolution, and in many cases have leapfrogged to become global leaders in providing ICT products and services.

The agriculture sector has not remained untouched by these changes. In developing countries, the general trend towards decreasing cost of ICTs and their increased availability, especially in semi-urban and rural areas, means that they provide real opportunities for the agrarian sector to benefit through increase in information flows, transfer of capital and investment, and increase in quality and relevance of services provided to them.

For instance, for the farming community, ICTs can potentially:

(i) Meet the information, technical and input needs of the farmers more efficiently;
(ii) Improve access to knowledge and technology among farmers and farm-linked institutions and;
(iii) Strengthen dialogues between and among farmers and farm-linked institutions.

\textsuperscript{1} South Centre (Inter-Governmental Organization), Geneva, Switzerland
\textsuperscript{2} International Association of Agricultural Information Specialists (IAALD), Netherlands
This in turn, this could lead to increase in farm outputs or greater value addition of farm products, resulting in increase in household incomes and quality of lives of the farmers. The potential is unlimited.

1.2. WITFOR and Agriculture

Agriculture is one of the eight commissions created under the aegis of World Information Technology Forum (WITFOR) to identify and demonstrate specific advantages of application of ICTs within the agriculture sector in the context of developing countries. This paper serves as a background note to the sessions organized by the Agriculture Commission at the WITFOR 2007 Conference in Addis Ababa, Ethiopia.

The sessions were organized around 4 themes to cover different aspects of use of ICTs in agriculture, namely:

- Creating ICT-enabled knowledge networks around agriculture;
- Promoting trade and competitiveness in agriculture using ICTs;
- Going beyond - innovative applications of ICTs in agriculture;
- Transforming farmers at farm-level.

1.3. Creating ICT-enabled knowledge networks around agriculture

This session focused on the network and community building aspects of ICT. The speakers presented real-life examples of how ICTs can be used to create networks among the agrarian community which can catalyse transfer of information, knowledge and expertise and create an epistemic community.

Such ICT-enabled networks can be created nationally, regionally and globally since the notion of national boundaries become redundant when it comes to electronic flow of information.

- Peter Ballantyne, President of IAALD (International Association of Agricultural Information Specialists) lead with his presentation on “Creating global network of agriculture information professionals” outlining how IAALD uses ICT, among other tools, to connect agricultural information specialists worldwide and provide platforms and spaces for information dissemination, exchange and knowledge sharing. See [www.iaald.org](http://www.iaald.org)

He provided insights into how ICT help bring IAALD closer to its mission, which is to enable its members to create, capture, access and disseminate information to achieve a more productive and sustainable use
of the world’s land, water, and renewable natural resources and contribute to improved livelihoods of rural communities.

- Awni Shdaifat, Manager of Yarmouk Agricultural Resources Development Project/ KariaNet – Jordan presented on “Regional networking of agricultural projects in Middle East and North Africa.” KariaNet (Knowledge Access In Rural Inter-connected Areas Network) is a multi-stakeholder partnership between the International Fund for Agricultural Development (IFAD), the International Development Research Centre (IDRC) and IFAD-funded projects in the Middle East and North Africa. See www.karianet.org

KariNet aims to enhance networking among IFAD-funded rural and agricultural development projects in the region in order to improve knowledge sharing and information/experience exchange through the use of Information and Communications Technologies (ICTs). KariaNet started in January 2005 and is spread over five countries: Egypt, Jordan, Morocco, Sudan and Tunisia. Ultimately, KariaNet will pilot an initiative that seeks to bridge the digital divide between urban and rural areas, and empower the rural through an improved access to information and knowledge.

- Steve Glovinsky, Advisor and Coordinator, Solution Exchange/UNDP-India shared his first-hand experience of “Setting up a national-level solution exchange” in India on a range of issues, including agriculture. Solution Exchange is an initiative of the United Nations Country Team in India that offers communities of development practitioners a UN-sponsored space where they can provide and benefit from each other's solutions to the day-to-day challenges they face. See www.solutionexchange-un.net.in/

As Steve underscored the idea that ICTs should be used to innovatively connect people who share similar concerns and interests, bring them together virtually and face-to-face towards the common objective of problem-solving. Solution Exchange communities are organized around selected development targets of both India's Five-Year Plan as well as the globally mandated Millennium Development Goals, contributing to their successful achievement. Members come from all organizations - government, NGOs, development partners, private sector, academia - interacting on an ongoing basis, building trust and strengthening their identity as a group.
1.4. **Promoting trade and competitiveness in agriculture using ICTs**

ICTs are transforming the way companies do business, but they are also an engine of trade in their own right. Within the agriculture sector, they can introduce the benefits of ICT to traditional export-oriented crops or shift focus to creating “new agro-enterprises” sectors, where use of ICT becomes integral to bringing about the product/service value-addition. Through either way, ICTs can promote trade and competitiveness of agriculture and broaden markets for agro-products leading to increase in domestic GDP. Importantly, these gains may accrue not only from enhanced export-oriented economy but also from increased trade between farmers and agro-businesses within the country.

- Aurelia Bondari, Executive Director, AgroInform and AgraVista, Moldova was scheduled to lead this session with her presentation on “Setting up an online agriculture stock exchange” in Moldova. Agravista is the first on-line Agricultural Stock Exchange in the Republic of Moldova. AGRAVISTA is intended for producers, traders and service providers of the agri-food sphere and represents a perfect tool for marketing the produce, offering at the same time the possibility of finding potential providers or buyers of inputs. See [www.agravista.md](http://www.agravista.md)

Within the stock exchange one can place advertisements regarding the demand or the offer of agricultural products, can observe the quantities and the marketing prices, as well as a multitude of information related to the legislation from the agricultural field, analysis and forecasts of the agricultural market, conditions for export and certification.

- Edgardo Herbosa, Director, B2BPriceNow.com, Philippines presented his award-winning innovation B2BPriceNow for “Promoting Agricultural Trade through e-Marketplace for Farmers.” B2BPriceNow is an e-marketplace that offers a variety of free services, designed to enable farmers, cooperatives, and other participations in the marketplace to monitor price information, buy and sell at the most competitive prices, and even pay electronically. See [www.b2bpricenow.com](http://www.b2bpricenow.com)

The website provides up to the minute price update on market information for agriculture, consumer manufactures, and industrial manufactures. It also enables farmers to use simple short messaging system (SMS) through their mobile phone to post or canvass up to the minute price updates of their various products of interest. Price
information of selected products per region is uploaded on a regular basis by the development assistance center or field offices of Landbank.

1.5. **Going Beyond - innovative applications of ICTs in agriculture**

Most things change with time. ICT has added a new dimension to the pace of change. Mobile technologies, wikis and blogs now ensure that ever more innovative application of ICTs within agriculture sector continue to surface. Nevertheless cutting-edge ICTs are not the only way to bring about innovations. Instead, even a not-so-new technology can be used in an innovative way or in an innovative setting to deliver results.

Thus strategic application of technology to a given setting is no less important than using cutting edge technologies to move beyond traditional application of ICTs to agriculture. This formed the rationale to demonstrate that developing countries should not be disheartened by their inability to adopt the latest and cutting edge ICTs, as this can be offset by using existing ICTs within more innovative settings or to solve problems which so far have not been attended to, through use of ICTs.

- **Justin Chisenga**, Information Management Specialist, FAO Regional Office for Africa, Ghana lead this session with his presentation on "The e-Agriculture Initiative: achieving the MDGs through sharing of innovative experiences." E-Agriculture is the part of WSIS Action Plan to ensure systematic dissemination of information using ICTs on agriculture, animal husbandry, fisheries, forestry and food, in order to provide ready access to comprehensive, up-to-date and detailed knowledge and information, particularly in rural areas.

  FAO has been appointed by WSIS to serve as the focal point and facilitator for the action line on e-agriculture and sees e-Agriculture as more than just a new way of using technology, as a contributing factor to achieve the broader goals, namely the Millennium Development Goals.

- **Dionne Clarke-Harris** IPM CRSP Coordinator / Caribbean Agricultural Research and Development Institute (CARDI), Jamaica made her presentation on “Developing a pest monitoring and traceability system - The Case Study of Hot Peppers” in Jamaica. She narrated how Jamaica employs a geographical information system (GIS), global positioning system (GPS) technology and a web-based surveillance network across 17 districts of the island as a part of its efforts to ensure that gall midge
and other pests do not become a barrier to export of hot peppers to North American and European markets.

This traceability system has now been enhanced to facilitate increased market access and to allow more rapid retrieval of information by all key stakeholders. With the growing importance of traceability in the global trade arena, these initial efforts at tracing hot peppers back to their farm of origin have been expanded to become a comprehensive traceability system for all export commodities. The net result is that while the gall midge and its other pest friends may still be there, but at least now we know where.

• Vikas Nath, Head of Media and Communications, South Centre, Geneva spoke on “School-on-Air: use of “Radio Broadcasting for Training of Farmers” in remote and mountainous farms in Philippines based on his experiences of evaluating an IFAD-funded project on agriculture knowledge networking in the Asia region.

Radio is the most accessible medium to reach the largest number of population in the rural areas. Supported by IDRC/ENRAP, the Cordillera Highland Agricultural Resources Management (CHARM) Project implemented a School-on-Air program to disseminate among farmers the best lessons learned during the project’s implementation in the provinces of Abra, Benguet and Mountain Province. The conduct of this school-on-air was similar to a classroom experience where learning is essential but the lessons were aired over three radio stations, all in Mountain Province.

1.6. Transforming farmers at farm-level
One of the most pressing challenges of integrating ICTs in agriculture is how to ensure that some of the benefits accrue directly to the farmers working on their farms, and especially those farmers who are in a disadvantaged position, and have a greater likelihood of getting bypassed unless an earnest effort is made to include them in the impact sphere of ICTs. These include the small and the marginal farmers, agricultural labourers, cattle herders, migrant labourer, and small fishermen, and includes more women than men as the ratios for marginalization are skewed to the disadvantage of women in the agrarian sector.

• P. Raghuvire, Additional Government Secretary, Andhra Pradesh, lead with his presentation on “Providing Agriculture Services to Farmers via E-Governance and Call-Centres” in India. In this presentation he drew attention to the various innovative projects taken by the Government of
His presentation strengthens the argument that even the simplest of technology, when applied within the right setting and in the right context can provide immense benefits to farmers. The way forward is therefore working in a problem-solving mode where ICTs are included in the project design to achieve specific results.

- Gyorgy Ngoryzy, Training Manager of the Hungarian Telecottage Association, Hungary discussed “Delivery Agricultural Services to Farmers through Telecottages since 1994: The Hungarian Public-Private Partnership Model.” Hungary currently has the world’s highest number of telecottages per capita and persistent dynamic growth. This rapid expansion has occurred within the timeframe of a couple of years, in a country in transition.

He illustrated how the telecottage idea was first manifested in Hungary in 1994 and today, more than 500 telecottages operate in the country. With this proliferation of community access points, the number of telecottages has reached a critical mass. This enlarged network has become the national backbone of community access and is proficient in finding unique ways to sustain its operations. Telecottages also jointly provide the public, civil and business spheres with a wide array of services, more than 60 in total. New possibilities are gradually explored and added to applications, based on regional characteristics.

1.7. **Discussions and Interactions**

WITFOR is not a monologue delivered by invited speakers, and it is not even a dialogue between participants and speakers. Instead it is an interactive, learning avenue where participants and speakers are both learners and trainers at the same time.

To aid discussions between and outside of the sessions, the following note prepared on the role ICTs can play in transforming the Agricultural Knowledge Systems.
1.8. **How can Information and Communication Technologies transform Agricultural Knowledge Systems?**

1.8.1. **Agricultural Knowledge Systems and Information Flows**

It is well-documented that agricultural research constitutes a sound investment in agricultural and economic growth, through improvements in farm productivity. However, strong linkage between ‘research’ and ‘practice’ is the key if increase in farm productivity is to be realized. Agriculture extension bridges the gap between laboratory and land or research and practice. The impact of embedding agricultural extension approach in the broader agricultural strategy has been significant—in enhancing farm productivity and in bringing new area under cultivation.

Any ICT enabled knowledge network aimed at improving the quality of lives of farmers has to be pivoted on agents who perform the role of agricultural extensionists (See Table 1). These extensionists not only act as an interface between research and practice but also serve as a knowledge bank by themselves. Being based in the region where they undertake extension work and staying in proximity to the farming community, they are more aware of the local situation and socio-economic conditions. They can therefore provide more appropriate and tried out solutions to the farmers, based on their learnings gleaned from solutions tried out by other farmers. In effect, they augment farmer to farmer transfer of knowledge, and also amalgamate local knowledge with scientific knowledge.

Information flows channeled through agricultural extensionists and other extension agents can be classified into three functional areas (See Figure 1):

- **‘Towards Farmers’ Information Flow:** to specifically include information flows originating from sources such as agricultural extensionists, research institutions, private firms, expert groups and agricultural universities and directed towards the farmers.
- **‘From Farmers’ Information Flow:** to specifically include information flows originating from farmers and directed towards agriculture extensionists, research institutions, private firms, expert groups and agricultural universities.
- **Lateral Information Flow:** to specifically include information flows between agriculture extensionists and other extension agents.
Figure 1: Agriculture Extension Agents Pivoted Knowledge Network

Table 1: Agriculture Extension Agents Pivoted Information Flows

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<th>Key Functional Areas</th>
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<td>‘Towards Farmers’ Information Flow</td>
<td>• Providing information on Land Management: arrangement of contour bunds and composting.</td>
<td>• Farmers become aware of recent scientific advancements in agriculture and allied sectors.</td>
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<tr>
<td><strong>From Farmers’ Information Flow</strong></td>
<td><strong>Lateral Information Flow</strong></td>
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| • Making farmers aware of new seed varieties, fertilizers, pesticides and techniques.  
• Providing information on crop management: cropping pattern, irrigation frequency and harvesting.  
• Providing information on crops being offered high market prices. | • Farmers are able to make more informed decisions.  
• Tacit knowledge of farmer becomes recognized.  
• Farmers feedback is incorporated into creation of new agricultural knowledge.  
• More specific research is undertaken which is in consonance with local situation and the socio-economic conditions under which farming is taking place. |
| **‘From Farmers’ Information Flow** | **Lateral Information Flow** |
| • Providing information about local agriculture and land conditions.  
• Communicating the results of adoption of new seeds, fertilizers and pesticide varieties by farmers.  
• Communicating information on new pest varieties, farmer innovations and harvest volume. | • Transferring of tacit knowledge of farmers.  
• Transferring results of adoption of new seeds, fertilizers and pesticides.  
• Spreading information about farmer innovations and experiments. | • Farmers are able to better understand the requirements for, outcomes of, and assess risks of, adopting new farm inputs and techniques.  
• Farmers are able to better understand scientific knowledge and are able to carry out innovations to customize new knowledge with local conditions. |
1.8.2. **Community-Based Knowledge Networks**

One of key applications of ICT in agriculture is in the area of knowledge networking, mostly at the national and subnational levels to ensure usefulness and applicability to local interventions.” An ICT-Agriculture Knowledge System (see Figure 2) takes into account this fact and establishes itself around the specific needs of the small farmers and information flows required to fulfil these needs. Such a network would have five sub-systems. These are:

a. Multi-purpose Agriculture Centres
b. Local Knowledge Portal and Databases
c. Local Knowledge Networks
d. Touch-screen Kiosks
e. Experts Group.

Figure 2: Schematic representation of ICT-enabled Agriculture knowledge systems


**a. Multi-purpose Community Centres**

Multi-purpose Community Centres are the key building block of Agriculture Knowledge Systems. They act as the epicenter of “towards farmers” and “from farmers” information flows, and the local knowledge network. It would require human resources (ICT trained Agricultural extension agents, Local Knowledge Managers, NGO workers) as well as technical resources (multi-media enabled computers, Internet connectivity, Digital Camera, CD-Writers).

The centre will:

- Provide agricultural extensionists and other agents (including members of the local knowledge network) access to emails, Internet, electronic databases and journals to keep them updated of recent advancements in agricultural knowledge of their interests.
- Provide access to publicly available databases, discussion groups, community of practice groups for redressal of queries posed by farmers.
- Provide access to customized knowledge portal and database for documentation of local knowledge.
- Provide differentiated level access to local knowledge portal and database.

**b. Local Knowledge Portal and Database**

The knowledge portal and database will serve as an electronic repository of information. The repository will archive information gleaned by agriculture extension agents through their interaction with farmers, replies to questions most frequently asked by farmers, and other local information relevant for farmers- such as rainfall predictions, market prices of crops and information about government and NGO schemes. It will include an Online Relational database, Database-driven website, Database and web-server.

The knowledge portal and database will:

- Allow information to be archived in form of text, visuals and sound file.
- Allow information to be updated by multiple agents, such as agricultural extensionists, NGOs and farmers.
- Allow information to be stored along thematic lines (such as land preparation, pest prevention, and market price of crops) and those specific to a geographical area (such as village specific information, district and governorate specific information).
- Allow information to be searched and retrieved based on pre-selected queries, along thematic lines or based on geographical areas.
c. Local Knowledge Networks
A local knowledge network will be pivoted around each Multi-purpose agriculture centre. The most important function of these networks would be to bring together agricultural extension agents, people based in local agriculture universities, research centres, agriculture directorates, NGOs, credit societies and other individuals who are engaged with farming community falling under the constituency of the multi-purpose agriculture centres, in an electronic network of information exchange. It will include human resources (Agriculture extension agents, local knowledge managers of other multi-purpose agriculture centres, local researchers, agriculture governorate officials, local media reporting on agricultural issues, NGOs and private firm workers) as well as technical resources (mailing and discussion software).

The local knowledge network will (i) complement information provided through the centres; (ii) redress specific queries posed by farmers and (iii) catalyze lateral information flows between different agriculture extension agents.

d. Touch-Screen Kiosks
The touch screen kiosks will catalyze farmer-to-farmer flow of tacit knowledge. In process, it will bring use of ICT closer to the farmers. They will consist of touch-screen enabled computers. Their task will be to (i) diffuse experiences, innovations and tacit knowledge shared by one farmer among other farmers; (ii) provide information to farmers in format which is comprehensible to the farmers; and (iii) enable farmers to obtain key information on their own, for instance, information on market prices and rainfall prediction.

e. Experts Group
An expert group will be set up to serve all the multi-purpose agriculture centres. The key purpose of the expert group would be to keep local knowledge managers in these centres updated of recent advancements in agricultural knowledge, and serve as redressal points for queries which could not be answered through knowledge managers and members of local knowledge networks. The group will be composed of interested people from national and international research institutes, agriculture universities, subject specialists, and moderators of various subject specific discussion groups.

The experts groups will catalyse “towards farmers” flow of information; redress specific queries posed by local managers of multi-purpose access centers; and diffuse information of significance relating to innovations
carried out by farmers, and other experiences and outcomes of farmer experimentation.

1.8.3. **Roles of ICT enabled Agriculture Knowledge Systems**

The ICT-Knowledge Network in the agricultural sector will have 4 key functions:

a. Catalyzing lab to land information flow
b. Query-Answering
c. Documentation of local knowledge and experimentation

**a. Catalyzing lab to land information flow**

Rationale: Since agricultural extensionists are one of the key agents to transfer scientific knowledge to the farmers, it is important that these agents have easy and regular access to information relating to recent agricultural advancements. The information could be in text, graphic or verbal format. When agricultural extensionists are more aware of new agricultural inputs and techniques, they will be able to better communicate new knowledge to farmers in their constituency.

Usefulness of Knowledge Network

- Provides multi-media enabled computers to view agriculture documentaries, databases available on CD-ROMS.
- Provides Internet connectivity to agricultural extensionists to enable them to access webpages of research institutions, online databases and journals, and if possible store them locally.
- Connects them to specialized groups and research communities to foster exchange of information through emails and online discussion groups.

**b. Query Answering**

Rationale: Agricultural extensionists are often unable to answer all the queries posed by farmers, for instance on new kind of pest attacks or performance of new seed varieties. Often adoption of new inputs and technologies by farmers lead to problems which the agricultural extensionists may not be trained to handle. In such cases, having a direct communication channel with expert groups on the subject, with other agricultural extensionists who have faced this problem, or with the private firm marketing the product can be very useful to provide timely solutions to the farmers.
Usefulness of Knowledge Network:
- Connects them to specialized groups, other agricultural extensionists, and representative of private firms through emails and who may be able to address the query.
- Provides them access to publicly available query redressal databases such as VERCOM (in Egypt).
- Provides them access to Internet to search different agricultural websites for possible solutions.

c. Documentation of local knowledge and experimentation
Rationale: Farmers possess tacit knowledge which has evolved based on their field-experimentation in the local settings. This knowledge is therefore more locally suited and comprehensible by other farmers. Understanding of this knowledge is of significance in designing new interventions and in customizing existing interventions to local conditions so that farmers can adopt them on their fields. Documentation of this knowledge therefore becomes a pre-requisite to creating new knowledge.

Utility of Knowledge Network:
- Provides access to custom-designed knowledge portal and database to document and archive local knowledge in a searchable manner.
- Allows documentation of tacit knowledge in text, visual and verbal format.
- Provides tools to access local knowledge from the knowledge portal and database.
- Can restrict access of local knowledge to known and recognized agents.

d. Augmenting farmer-to-farmer learning and diffusion of knowledge
Rationale: Farmers are able to effectively communicate agricultural knowledge and experiences between them, and this spurs adopting and innovation cycle for any intervention. This is because farmers are better able to comprehend experiences and information provided by other farmers in comparison to other agents of information transfer. However farmer to farmer learning may be limited when farming communities are dispersed. It is therefore imperative to catalyze farmer to farmer learnings between distant farming communities.

Usefulness of Knowledge Network:
- Provides farmers access to touch-screen kiosks where they may be able to view experiments tried out by other farmers on their fields, or hear the results of adoption of new interventions in farmer’s own language.
• Provide progressive and educated farmers access to emails to address their agricultural queries to other such farmers.

1.8.4. Public – Private Partnerships

From a farmer-centred development perspective, use of ICT in agriculture implies employing ICT tools in processes that can yield significant benefits for farmers, either directly or indirectly. Based on this ideology, 4 types of partnerships can be forged in the area of “ICT for Agriculture Development”. These partnerships can be made with both public and private institutions, depending on their capacities, reach and the effectiveness of their actions. While public institutions, by principle, are mandated to provide services either free of cost, or at a cost-recovery basis, the private institutions may provide their services after a profit margin. In cases, where public services are simply unavailable, or where farmers visualize substantial private benefits of an intervention, the services provided by private sector institutions fulfil a crucial need in the agricultural sector.

Four types of partnerships aimed at:

a. Providing affordable ICT access and connectivity to farmers and farm-linked institutions
b. Providing relevant content or content experts
c. Training and capacity building
d. Reaching targeted communities.

a. Partners providing affordable ICT access and connectivity

These partners can provide means and avenues to enable farmers and farm-linked institutions to access ICT tools at an affordable cost. Partnership support could be in terms of providing hardware and software applications, telephone mainlines, wireless connectivity, broadband network or access to existing telecentres.

Access provided by these partners may be existing institutions such as schools, telecentres, research stations, or even post offices.

Affordable cost implies either for free or at rates which could be easily borne by local institutions or the community.

b. Partners providing relevant content or content experts

Providing affordable access and connectivity by itself cannot catalyze flow of agricultural information unless relevant content exists which could be communicated among and between farmers, farm-based institutions, and public domain.
Partners under this category will:

*Either*, provide content on agriculture and related issues in a format that is *comprehensible* to the end-users,

*Or*, provide experts who are knowledgeable on one or more agricultural themes and can communicate their knowledge in a *comprehensible format* to the end-users.

**Comprehensible format** implies that the content or knowledge which is transmitted should be in the vernacular language of end-users and specific to the local requirements. The content may be comprehensible agriculture information / expertise existing within the partners or sourced from outside. Partners will have the expertise to search for relevant content and experts from available public domain information and to create new content specific to the local users.

c. **Partners providing training and capacity building support**

Partners in this category will provide training and capacity building support to end-users. These would be of 2 types:

a. **On use of ICT tools.** This involves training individuals and building capacity of farm-linked institutions in use of ICT tools such as computers, word processing, database entry, HTML applications, emails and the Internet

b. **On searching of relevant content and making it comprehensible for end users.** This involves sensitizing farm-linked institutions (and maybe some progressive farmers) to existing sources of agriculture information and expertise, training them to carry out thematic searches over the Internet and in databases, and in transforming the existing content into a comprehensible format (for instance changing scientific agricultural terms and inputs into vernacular language). Imparting skills of this type implies that the partner organization should be working on agricultural issues from beforehand and be knowledgeable about the local farming community and their indigenous practises.

d. **Partners reaching targeted communities**

This is an important category of partners and partners in this category should be identified carefully. The partners should be able to address the information, technical and input needs of the farming community, including small farmers. These partners should either be in proximity of the farming community or may be an important existing source of information for the farmers.
These partners may either be farm-linked institutions or even individuals or “champions” who maintain close linkages with the farming community. In essence, these partners would act as a hub of agriculture-related information flow for the farmers in order to harness the true potential of ICT applications and ICT enabled knowledge networks to improve the knowledge of the rural poor.
2. Building the infrastructure

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2.1. Introduction

Currently one of the most widely used indicators to appreciate the development level of a certain country is the capability of its citizens to be connected and access the Internet. Ten years ago it has been indicated that the difference between rich countries and poor countries will be defined in a near future by the capability of its citizens to access information. This prediction was underestimating since the current development of Information and Communication Technology (ICT), the second generation of Web and the network application permit people to access technologies and get services unimaginable some years ago. These technologies and services can improve their knowledge, health, business and, in one word, their quality of live.

But, once again, the level of implementation and use of these new technologies is not homogeneous because they depend on the network infrastructure of each country or area. This inequality is evident not only among different countries but also in regions or areas of a same country and it contributes to increase the differences between their inhabitants because the opportunities of some of them are evidently much less.

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\textsuperscript{9} Technical University of Dresden, Germany  
\textsuperscript{10} San Diego State University, USA  
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If the development of the Information Society follows the current trend and there is not effort to reduce the digital gap improving and promoting connectiveness, the social and cultural differences between people will still continue and increase.

In this context and following the statements in the Vilnius (2003) and Gaborone (2005) declarations the Commission Building the Infrastructure has selected a set of Projects and Cases of Study that can efficiently contribute to build the network communications infrastructure in developing countries and consequently giving the opportunity to reduce the digital gap, making much easier to their citizens the advantages of the Information Society.

In the Commission we have also paid attention to those researchers from developing countries working abroad or in their own universities that are fully aware of the importance of this concern and study and do research into new technologies to build low cost network infrastructures. Finally, the experience of governments, other countries and distinguish researchers are a great value for our purpose.

2.2. The case of Ethiopia

Despite the undeniable technological growth in the recent years the sub-Saharan Africa is still far from the level of the main countries in the world. There are no reliable statistics and development indicators related to the ICT sector which limits analytical and numerical studies and the development of the appropriate policies and priorities to build the most convenient communications infrastructure.

Ethiopia with a population over 70 million, is one of the countries in the Sub-Saharan Africa with the lowest number of fixed telephone lines and mobile subscribers, in a similar level than Cameroon, Kenya, Uganda and Zambia. As a consequence Ethiopia is one of the countries with lowest number of Internet penetration and users. The Ethiopian Telecommunications Corporation is the sole provider of the fixed, cellular, Internet services and international gateways under a monopoly structure which obviously does not contribute to increase the services both in number and quality while the number of pirate operators increases and prices are arbitrary. As many other countries the government perceives the liberalization of the sector as a lost of important revenues and it is not able to see the indirect potential benefits of forthcoming companies and services.
2.3. **Commission Overview**

Following the editions of WITFOR 2003 (Lithuania) and WITFOR 2005 (Botswana), WITFOR 2007 (Ethiopia) ([http://www.witfor.org/](http://www.witfor.org/)) is the next step in reaching the goal of assisting developing countries to implement sustainable strategies for the applications of IT and to start projects that help to bridge the digital divide and improve the quality of life.

The Commission “Building the Infrastructure” covers the following themes:

- Support an enabling and competitive environment for the necessary investment in ICT infrastructure;
- Provide and improve connectivity (communications infrastructure) for all places accessible to the public (schools, libraries, post offices, etc.); and
- Develop and strengthen national, regional and international broadband network infrastructure.
- Provide and improve content of information and knowledge stored on and transmitted by the ICT networks.

Infrastructure should not be considered as only equipments, but it should be understood as: Technology, Services, Human resources, Legal and regulatory framework and Economy. Some recommended actions for building a sustainable ICT infrastructure are as follows:

- Adherence to International standards should be encouraged and when appropriate enforced.
- Operation and maintenance should be considered from the very beginning of any ICT project to ensure project success and sustainability. “Do not invest in what you can not maintain”.
- Promotion of universal Internet access should be supported to minimize the risk of widening the digital divide.
- Implementation of new ICT services should be encouraged.
- On-going education at three different levels: executive awareness level, user skills level and professional technical level.
- Governments should formulate a long-term vision, set policies, regulate, protect the users and control the quality of services.
- Regulatory authorities should be in charge of a comprehensive regulatory framework to enforce efficiency, competition, transparency and universal access.

2.4. **Selected Projects and Case Studies**

According the objectives and criteria mentioned the commission has selected a number of projects and case studies and a few are summarized below.
2.4.1. **The RURALMAYA Project**

RURALMAYA began in 2005 as a research project of the Technical University of Valencia in Spain. The general purpose of RURALMAYA is to strengthen Internet support in rural environments through wireless technologies in the Comunidad Valenciana, Spain. The system should empower mobile users with the ability to access Internet applications on the move. Rather than creating a new wireless technology, the major challenge has been to demonstrate the practicality of designing and building a system that, by combing existing wireless networks paradigms, is able to reach distant areas at a low cost, while offering a wide range of telecommunication services and applications.

Researchers developed an experimental wireless system, called RURALMAYA, which extends the capabilities of hotspots to provide wireless connectivity at distant areas and at a low cost. The system combines the promising paradigm of Wireless Mesh Networks (WMNs) with the Captive Portal technology, and it is based on the use of commercial off-the-shelf wireless devices. WMNs represent a good solution to provide Internet connectivity in a sizeable geographic area, and allow us to increase the coverage area of hotspots at a much lower cost than with classical Wifi networks. Every client within the coverage area of RURALMAYA can access all the services offered, which does not mean free access or uncontrolled access. Our system is implemented under a captive portal solution based on the use of wireless access points to provide both an effective user authentication and physical connectivity to the backbone.

The system has been designed to be scalable, and easily upgradeable to cover a wide area at a low cost. With this purpose we selected a multi-tier approach where all the subscribers are connected to the Internet through a main server which acts as a gateway to the Internet. RURALMAYA combines three different interconnected tiers (a) a wireless mesh distribution network, (b) a backbone wireless/wired network, and (c) a top level management system. This approach allows creating a scalable network which is able to cover a vast area, connecting the main server with all the clients within range of any of the APs deployed. The system consists of top level management system, backbone network and distribution network.

The system is currently implemented using several programming languages and tools as applications running in user-space, and is a proof-of-concept to demonstrate the feasibility of the RURALMAYA architecture through extensive operation. We studied the system performance and also acquired experimental data, allowing us to evaluate the capabilities of the Linksys
routers and the captive portal functionality. The experience acquired during this project made evident that, by combining both wireless and web technologies, we are able to offer a cheap and efficient solution to provide Internet services to rural areas where users are sparsely located.

2.4.2. The DakNet Project by United Villages

Over two billion people living in rural areas lack access to information and communications services because telecommunication companies and governments have not been able to provide a sustainable, cost-effective infrastructure. While the cost of connectivity rises dramatically with the distance from backbone communications infrastructure, population density and income per capita (together, income per sq. km.) decrease dramatically. This has resulted in a “digital divide” for areas beyond the economic reach of sustainable communications infrastructure.

United Villages, Inc. offers a way to provide people in under-serviced rural areas with a digital identity – a lifetime phone number and email address – for under $1.00/person in capital expenditure and $1.00/year/user in aggregated operating costs. This has become possible through patent-pending research that was originally conceived by the founders of United Villages while at Massachusetts Institute of Technology (MIT). In 2003, the founders started United Villages to develop and commercialize the technology, which has been implemented on a pilot basis in Asia, Africa, and Latin America.
The technology distributes bandwidth from Internet connection points as far as the road goes. Our Mobile Access Points (MAPs) are mounted on existing vehicles (e.g. buses, trucks, and motorcycles) to provide “drive-by WiFi” access as they pass through villages with WiFi-enabled Kiosks operated by a local service provider. Each MAP typically drives by 10 village Kiosks and, whenever it is within range of a real-time connection to the Internet, including cellular data networks, it uploads and downloads all of the data from and for those Kiosks. In India we have branded this network as “DakNet”, since *dak* means “post” or “postal” in Hindi.

United Villages sells Digital Identity and 16-digit Recharge Cards to the village Kiosk Operator who resells the cards to end-users at a margin and delivers the services, which include:

- Sending and receiving voicemails, text messages, and emails using the Kiosk PC;
- Accessing the Web and various locally-relevant information caches using our cached Web portal;
- Accessing services such as job searches, railway reservations, health queries, and agricultural queries;
- Purchasing and receiving products such as medicines and books that villagers otherwise have to travel to a larger town or city to procure.

For cellular operators, our Mobile Access Points also represent a very low-cost subscriber acquisition model for areas beyond the economic reach of traditional communications infrastructure, driving new voice, SMS, and data traffic to maximize network utilization and valuations. Our Mobile Access Points integrate seamlessly with GSM and CDMA data networks and our digital identity cards and prepaid user accounts can become stored-value accounts for other financial transactions.

### 2.4.3. EHAS

One of the selected projects has been developed by EHAS "Enlace Hispano Americano de Salud", which means "Hispano American Health Link". This organization is very concerned about the difficulties of a reliable communications infrastructure in developing countries, where rural areas very often lack of any access to the public telephone network or even to electricity and the low density and low concentration of population make difficult to afford the installation of permanent infrastructures that would be expensive due to typical restrictions in power service, accessibility, maintainability and security. EHAS focuses on the Health Area and develops telemedicine low cost telecommunication systems and information services
specially designed for rural primary healthcare personnel from isolated areas in Latin American countries.

In general terms EHAS initiative has six lines of action: 1) Research on the communication and information needs of rural health personnel in developing countries, 2) R&D on voice and data communication systems designed according to conditions of rural areas, 3) R&D on information services systems suited to the needs of health personnel, 4) Deployment of those services and systems through pilot projects, 5) Evaluation of the impact of these Telemedicine systems on health services, and 6) Spreading of the knowledge acquired.

EHAS have carried out several pilot projects in the last years. The first pilot experience took place in the health network of Huallaga in Alto Amazonas, Peru. 39 EHAS telecommunication systems were deployed. It consisted of 7 email servers and 32 client systems. The network came into operation in September 2001. Following the initial results of the impact evaluation of Alto Amazonas, EHAS considered other pilot projects: two new areas in Peru: Marañón network in the Loreto region (22 systems) and QuispicanchiAcomayo health network in the Cusco region (13 systems); two in Colombia: a radio network in the jungle of Pacific Coast (12 systems) and the Municipalities of Silvia, Jambaló in the department of Cauca (22 systems); and one in Cuba, in the province of Guantánamo (28 systems).

Currently EHAS is leading several international initiatives, among others: an IberoAmerican project focused on Rural Telemedicine funded by Latin American Program for Science and Technology for Development (CYTED), a project funded by the InterAmerican Development Bank (BID) aimed to design a communication infrastructure for more than 200 points in the Peruvian jungle, and is also involved in a Project against Malaria with the participation of Regional Andean Health Organism (ORAS) and financed by the Global Fund. These new projects will make use of the new tools developed in EHAS laboratories, such as a low powered WiFi router for long distances, a VoIP phonepatch, or a rural telemedicine system using WiFi for carrying medical data (teleconsultation).

2.4.4. **Integrated SMS & IM Mediated Price Information Management**

It is widely believed that mobile wireless technology provides a huge potential in helping transform the lives of the vast majority of rural and poor citizenry of the world’s developing countries, particularly those in Asia and
Africa. However, this potential remains untapped and unrealized in some of the poorest of the poor regions of the world such as Sub-Sahara Africa because the technology has not been simplified and offered in the most basic, understandable, easy-to-use, affordable and culture and language localized way.

There is an unmet need for enabling mobile phones used in these emerging economy countries to be adapted to the local language and writing system. For example, in Ethiopia, the majorities of new mobile subscribers are from the semi-urban and rural areas and understand only the Ethiopic/Geez writing system. The introduction of script/writing system localization for wireless cell phones will offer the following key and fundamental advantages:

1. Bringing efficiency and fair trade in the market system for key farming products such as coffee, sorghum, teff, etc. The farmers will be able to follow market conditions elsewhere through text messages (on mobile phones and PC) and further text back their offers to middlemen. The case of coffee growers in Kaffa/Jimma, Ethiopia still being unable to leverage their products to get a fair price for their products is a good example where the localized mobile technology can be used to bring a more equitable and enriching position for the farmers.

2. AIDS education and counseling. People with AIDS/HIV virus can text their questions through their cell phones or PC (where SMS text messaging service is not available) and a customized and confidential counseling could be provided to them in their own language and their own writing system at their finger-tips almost instantaneously.

3. Enabling newer value added services such as sending of money from relatives in the cities or in Diaspora to people in the villages. The localization of the process makes communication understandable even by people in remote areas who can read and write the local languages (Amharic, Oromo, Tigrigna, Arabic, etc)

The proposed technology is planned to be tested, verified and validated through a pilot project that involves setting up a team consisting of farmers, students’ software development team. The farmers in Jimma, Yirgachefe, and Harar will be able to send a message from a PC to the student interns in Addis with the day’s coffee prices. The interns, further, will then be able to collect live coffee market data from locations in Addis Ababa and send to a central server. Further, this daily data from Jimma and Addis is instantaneously sent to the central server and compared with data collected by the team. A typical mobile communication that involves cell phones and PC costs only a few cents in a daily basis and offers immense demonstration to the farmer in Jimma who is able to get text message (through PC pending
the resumption of mobile SMS in Ethiopia) on real-time data on the huge mark-up his/her product experiences in a daily basis. The uniqueness of this proposal are localization of mobile phones in local writing systems (Ethiopic) and the integration of a Mobile Internet protocol (mobile IP) with SMS technology to provide an enabling platform for the vast majority of people living in the emerging markets of the Horn of Africa.

2.4.5. E-Infrastructure Support for Rural Small and Micro Enterprises

The Goal of the project is to craft Grid-based Utility Infrastructure for SMME-Enabling Technologies, GUISET. The project emphasizes the need for some type of cooperative enterprise formation such as is common in most developing economies. The governments of some countries assist these cooperative formations to register as limited liability companies. Nigeria and Kenya are examples of countries where this is the practice. The enterprise therefore provides a corporate structure for sharing resources among its membership with the expectation of good returns on corporate investment. First, this project aims at e-enabling the business activities of a cooperative enterprise. This translates to affordable access to necessary technology on a pay as you go basis. Secondly, the technology is conceptualized as a package of mobile e-Services, therefore web presence is the starting point for the enterprise being enabled. Thirdly, the culture of sharing becomes the driving force that pools together, into a cooperative asset reservoir, members’ entrepreneurial skills, capital fund and operational equipment. It is assumed that members have a common goal of (a) vibrant entrepreneurship, (b) sourcing of investment finances as a corporate entity and (c) pooling of local and external operational resources for sharing. The challenges are to (i) find the low-cost connectivity that makes the technology affordable and; (ii) make the participants contribute to or extend an existing lucrative value network. This is where access to mobile technology in a rural setting, if it were to be made affordable, becomes a ready made value network that our project can extend for economic development of the rural community.

In order to make the cost affordable to small entrepreneurs, we propose an array of business models from which they can choose. First, the Grant-aided business model assumes some form of financial backing from external donor or investment funding at non-market interest rate such as used in Development Bank of Southern Africa model. The main issue here is that some minimum free service is provided to paid-up cooperative members. Beyond this other services are rendered as Value-Added Services depending on the quality of service requirements of the member. Second, Franchise
business model requires that the cooperative group become a franchise of some sort sourcing fund from some financial entity at the going interest rate. Being a limited liability enterprise, the cooperative group will receive a credit rating for the amount of capital fund being sought. Third, the traditional business model requires that some existing TELCO will have to be relied upon to come and extend services to the community under consideration. Community members are employed at a fee.

The research is sponsored by the South African National Research Foundation in collaboration with the industry, partnering with Nokia through CSIR of South Africa. Industry players involved are Telkom SA Ltd and Huawei SA (PTY) Ltd. The community adopted for trial cases is called Nongoma Art and Craft Route, a cooperative group recognized and registered with the KwaZulu/Natal Provincial Government. Figure 3 shows the area view of Nongoma community.

2.4.6. The Prospects for Fiber Optics Initiatives in Africa: Case Study

Several initiatives have been taken to connect the African continent with submarine fiber optic cables to enable Africa countries to have access to the international telecommunication market. Among the first of these were two projects advanced by transnational telecommunication companies in 1993 and 1994. Siemens submitted a proposal called Fiber optic Link Across the Globe (FLAG). ALCATEL, in collaboration with AT&T, presented a different proposal called Africa Optical Network, simply called African One. Africa One was slow to take off because, in 1997, Tyco Submarine System bought out the AT&T interest. The Africa submarine project later materialized as the Third Southern Africa Telecommunication /West Africa Submarine Cable/ South Africa-Far East Project (SAT3/WASC/SAFE). The project consisted of three fiber cable projects - the Third Southern African Telecommunications cable, the West African Submarine cable and the South Africa Far East cable. The project is known by the acronym-SAT3/WASC/SAFE, the project. The SAT3/WASC/SAFE is an international fiber optic network that connects Portugal to South Africa linking the entire west coast of Africa then crossing the Indian Ocean to East Asia. The Eastern African Submarine System was proposed in 2003 with the main goal of improving the quality of telecommunication services and reducing cost of bandwidth in Eastern African countries. The project is being developed by fifteen telecommunication companies from thirteen East African countries. The fiber optic cable project is expected to run from Port
Sudan in the North to Durban in South Africa. The 9,900km submarine cable is expected to be operational by the last quarter of 2007.

It is evident that the SAT3/WASC/SAFE project is not adequately benefiting Africa countries. The high cost of bandwidth, monopolistic tendencies by Telekom South Africa and other national carriers and under utilization of the network are hindering the set objectives of the project. In addition, the initial misunderstanding of the EAASY project by the members of its consortium is also creating unnecessary tension. Hence, Kenya wanted to set up its own network. There is need for African countries to put in place a well coordinated plan to ensure that the two main projects do not duplicate efforts. There is need for to introduce competition among the local telecommunication companies by breaking monopolies among the national carriers. This will go along way to reduce the high cost of fiber optic broadband use in Africa.

To enable African countries to realize the tremendous revolution taking place globally in terms of modern telecommunication, there is the need for African countries to utilize a mix telecommunication infrastructure to leap frog their economies by relying on the varied opportunities provided by these technologies. Such projects serve as opportunities for Africa countries to utilize the telecommunication infrastructure to enhance socio-economic development for all their people.

2.4.7. Application of Wireless Sensor Networks: Case Study

Sensor networks are relevant to developing countries for applications such as environmental observation and forecasting, disaster prevention, agricultural management, structure and habitat monitoring. In the area of environmental observation and forecasting we find a plurality of applications that, on the one hand, aim at establishing an early warning system to protect the population, and on the other hand, provide researchers with the means to study certain phenomena. This is because instrumenting natural places, such as national parks, volcanos, riverbanks, rift zones, and woods with numerous networked sensor nodes can enable long-term data collection at scales and resolutions that are difficult to obtain otherwise [3]. The intimate connection with its immediate physical environment allows each sensor node to provide localized measurements and detailed information that is hard to obtain through traditional technology. Sensor networks can also be used for hazardous workspaces like underground mining, steelworks, and refineries. Most of these places entail a high risk by nature which is amplified by
poorly engineered constructions in developing countries. Wireless sensor networks can be deployed in underground mining for surveillance of deteriorating grounds, toxic gases, and unstable grounds. In refineries sensors can be used to track workers which can facilitate to alert an operator if someone accidentally enters a temporary hazard zone or to guide firefighters to the people in danger. These applications can help to increase workplace safety and thus save many people’s life.

In order to map out a farming strategy that uses the available resources most effectively, information on the temporal and spatial variability of environmental parameters, their impact on soil, crop, pests, diseases, and other components of farming is needed. Using the recent trend of soil moisture values recorded by sensors and the knowledge of these points, the farmer can predict the behavior of his crop and use simple water management techniques. Wireless sensor networks can be successfully employed to support resource-poor farmers in developing countries. Scarce precipitation and a high demand for food forces them to increase their crop employing better farming strategies. Here, the reliable and detailed information gathered by the sensor network about soil moisture and other environmental parameters proved to be the source of these achievements.

In many developing countries we find old and derelict infrastructure. Bridges and railroads, perhaps built several years ago, are still in use and are at the same time extremely vital points of the transportation infrastructure. Historical buildings such as churches, castles, and monasteries are in bad repair but these objects of cultural value are obliged to be preserved for future generations. Here, seismic and pressure sensors can be deployed to detect and localize stress fractures. A precise knowledge of stress fractures can be applied for predictive maintenance and for issuing timely warnings to users. Habitat monitoring is an important means to better study the behavior of animals with regard to breeding, movement, foraging, etc. In this way potential relations to typical challenges of developing countries like deforestation, monocropping, and new human settlement as well as the global warming problem could be identified. Wireless sensor networks can help to advance in this research area whereby also the whole society can profit by preserving rare species in biological reserves.

Even though the whole range of practical implementations are yet to be developed, we expect essential progress from the research community in the near future. Joint projects that bring politicians, researchers, manufacturers, and most important people on the ground together, must be set up to realize the proposed applications.
2.4.8. Exploring the Capabilities of the Powerline Communications: Case Study

Powerline communication can be seen as an untapped broadband infrastructure for developing countries. The important approaches and experiences of the developed countries in deploying broadband over powerline and highlights of the best way forward to minimize the digital divide not only between the developed and developing countries, but also between the urban and the rural communities of the developing countries are recommended.

Powerline Communication (PLC), also called Broadband Powerline (BPL), is the technology of transmitting high frequency communication signals (voice, data, Video) on an existing electric supply network in addition to the 50/60Hz electric supply for which the network was primarily intended. Due to the higher penetration of electric network in any country, compared to the telecom penetration, utilizing the electric supply network as an alternative infrastructure to the provision of broadband services would exponentially increase the overall telecom penetration of any country. PLC deployments in different regions of the world show that PLC is an easily deployable and cost effective broadband service for sub-urban and isolated rural communities, where major telecom infrastructure is not available. Even if the utilization of electric network as a narrow band information medium dates back to the beginning of the last century, the service was for long years limited within the utility company for controlling of substations, voice communications, and protection of high-voltage transmission lines. However, since PLC has evolved to an alternative broadband infrastructure for IT service providers the advantage for the electricity utility companies in controlling and monitoring their electric grid is also improving.

The many years of efforts, experiences, approaches and methodologies of the developed countries for the deployment of broadband services in general and that of PLC in particular, would help in planning and materializing the PLC in the developing countries. This would help to create economically feasible and efficient approach in the efforts of introducing and commercializing PLC and to make the broadband service accessible to the rural communities where the other broadband service would require much long years to reach. Even if many more can be adopted, only the main important lessons from Germany, Austria, USA and Spain are outlined here to learn what preconditions are to be fulfilled and which approaches would help to shape the broadband policies in the developing countries.
2.4.9. The BorgouNET project

BorgouNET was an original initiative in North Benin, which enabled government and market gaps to be filled with regard to modern means of communication. Many cyber communities have come into existence thanks to BorgouNET NGO’s activities, thus also enabling development stakeholders to communicate effectively according to their financial means. In particular, BorgouNET NGO enables its cyber-communities to offer a connection at 300 FCFA/hour to scholars, students and development agencies in Parakou, while in Cotonou the capital, the cost of browsing is 500 FCFA/hour for a comparable connection. A computer maintenance contract with BorgouNET NGO costs 5 000 F/month per PC, while the same contract could cost 25 000 FCFA/month per workstation in Cotonou (the capital), a ratio of 1:5.

The Swiss program PADS, currently PSS (Socio Sanitary Program) of Parakou which requires strong communications between development partners and the base (in accordance with guidelines between the donor and the local project officers) has been able to communicate via the BorgouNET server, and avoid almost daily commutes over a distance of 300km for the simple retrieval of instructions by electronic mail. The cost of monthly RTC subscriptions to BorgouNET is 12 000 CFA F, which is much less than a daily commute of 600km (return trip) in order to get messages.

A school establishment in Parakou with computers at its disposal, and wishing to provide continuous and superior internet access for its pupils, has subscribed to BorgouNET to benefit from unlimited access to the Internet for 80 000 CFA F per months. Using the only other telephone line ISP (The Post and Telecommunications Office, whose server is in Cotonou) would have cost 700 000 CFA F per months, which would not have been feasible for them.

BorgouNET enables the university of Parakou community, and especially the students, to browse at an affordable cost. The University receives payment, and the students download information or scientific publications that would otherwise be unavailable or very expensive. Correspondence is fast and less expensive.

North Benin is a disadvantaged area with regard to NICTs. Since its establishment, BorgouNet has shown, through its various activities, its wish to satisfy the need for optimal NICT access for development agencies in the town of Parakou. The ease of access to information and communication that we now have means that there are no more obstacles to the establishment of
economic operators. This represents a significant contribution by Borgou to the community.

Since February 2007, Benin government decides to cover all the country by optical fiber to allow Internet connection and wireless phone by CDMA technologies. So, BorgouNET NGO will continue to support government actions by given formations in ICT area specialized on Network managing on Linux Servers.

2.4.10. The Human Factor

Finally, it is necessary to remember that the communications Infrastructure is not only hardware and software: it is also PEOPLE.

All components needed for building the infrastructure of any telecommunications or information system in any country (developing and developed) are of little relevance unless the country has the appropriate human resources with the proper education level that are able to decide, install, maintain and properly use the set of physical components, software and services. Otherwise, several drawbacks will appear and the investment effort did to install some infrastructure will become a wasting of the money spent to buy it. An ICT infrastructure shouldn’t be created unless the availability of appropriate human resources, mainly the technical staff. The education of the end users can go along with the planning and installation of the infrastructure. However the initial critical point is the good understanding of the capabilities and planned uses of the infrastructure by the executive people in charge of taking decisions.

For building an ICT infrastructure sustainable and technically supported by local human resources, a short summary of the recommended actions related the availability of such resources, follows.

- Infrastructure should not be viewed as only hardware, software and technology products, but should also include human resources. Without an adequate supporting infrastructure, the general public will be deprived from their rights to access important and useful services.
- Operation and maintenance should be considered from the very beginning of any ICT project to ensure project success and sustainability. “Do not invest in what you can not maintain”.
- Sustainability requires on-going education at three different levels: executive awareness level, user skills level and professional technical level.
• Developed countries and international organizations should support professional training, postgraduate formal studies, research and development, in developing countries, as a way to bridge the digital divide.

• Internet is a key factor to the new world. Promotion of universal Internet access and to true value added services should be supported to minimize the risk of widening the digital divide, good examples of that are telecenters and student universal access.

• International standards should be well known by the people in charge of taking decisions on how to build the infrastructure, by the people in charge of managing it and the adherence to these international standards encouraged and when appropriate enforced.

• Implementation of new ICT services that help the development of a country and its people - such as e-learning, e-government, e-health, etc - should be encouraged without forgetting the people needed for their correct implementation and adaptation to the local characteristics and needs.

2.5. Conclusion

WITFOR 2007 gives us the opportunity to exchange experiences about communication infrastructure projects and applications in developing countries. Under this goal, the Building the Infrastructure Commission has selected an interesting set of projects and case of study that not only focus on how to build affordable communication technology and infrastructure for developing countries, local communities or rural areas by making best use of whatever resources are available, but also consider the difficulties for managing this technology for citizens which usually are illiterate or have great difficulties to read in a foreign language. The needs of training the citizens to plan, install, maintain and use the communication infrastructure have also been pointed out in this commission.

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3. Economic opportunities

Satish Jha

Economic Opportunities: Preparedness is The Key

3.1. Introduction
The Economic Opportunities Commission of WITFOR has been engaged in looking at the ultimate outcome of various aspects of ICTs that have been shaping their evolution in terms of how they help extend its reach and generate incomes for those who constitute the new frontier of development. It focused on how some of the newer formations that included a new technology (e.g., Wiki), a new application (Telecenters), a new business model (BPO) and a new movement (Open Source) have been changing the landscape of possibilities of generating incomes for the new entrants to the work force and discussed their impact from a rather diverse perspective. In the four sessions that included 15 presentations, a lot of ground was covered and some of its key aspects are captured in the following summary.

3.2. Context
Since the internet became widely accessible and the worldwide web broke out on the horizon, information technologies have inexorably been shaping our world at a pace faster than we could imagine a decade ago. They have been defining how we work and communicate and what we have become. Every new technology has changed the way we work, its design, the processes that integrate pieces of work we do and create new values, the way we communicate and shape our world. Web technologies have given them

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15 Digital Partners, India / USA
16 The author is grateful to the panelists who presented in the four sessions covering Wealth Creation by Collaboration, Open Source Models, Emerging Business Models of BPO and Telecentres and the New Opportunities Frontier including (in no particular order) George Sadowsky, Atanu Dey, Michel Bauwens, Eddan Katz, Chris Uwaje, Jon Hall (Maddog), John Hawker, Lee Thorn, Nathan Eagle, Monique Morrow, Rishabh Ghosh and Meddie Mayanja. Their thoughts are interspersed across these pages in various measure and in case some aspects of their thinking are lost in translation or not captured, I would hope to integrate them during the next opportunity. The author expresses his special thanks to Dorothy Gordon for being a great co-chair of the commission.
all a new dimension. Most importantly, these technologies are creating new opportunities to make our lives easier, healthier, richer, giving us longer life, bridging people, communities and nations, collapsing time and do so continuously, creating ever new opportunities for everyone who is ready, able and willing to see and grab them.

Generally, all new technologies that are discontinuous in their characteristics have transformed not just the scope of what we do and how things change. They have also accelerated the rate at which things change. They have continuously accelerated the rate of change of employment. Not so long ago, the received wisdom dictated that the lower forms of technology or simply put, older technologies, created more employment than the newer inventions. By now most people are willing to discard those notions as they see the new kind of work created by ICTs generating employment at a pace that challenged our imagination. Moreover, the economies that are ahead on the technology curve have been operating at closer to full employment and those that set the trends in technology cannot do without significant immigration of various levels of skills on a continuing basis.

Though differentially, Information and Communication Technologies have dramatically increased the efficiency of a whole range of businesses, and opened up a new flow of information about economic opportunities. They are laying the foundation of how work will be dynamically designed during the times to come, at a pace of change our civilization had not witnessed before.

These changes are creating opportunities along the way, from the newest frontier of scientific knowledge to the remotest place on earth where services unimaginable to be found just a few years ago can be, at least potentially so, delivered seamlessly. These range from starting up as a lay user of these technologies and move up the chain to becoming a programmer, a web developer, designer to operating various new devices that add value and therefore contribute to the quality of life and incomes across the market spectrum. For developing and emerging economies, it offers opportunities at each level to respond to the market needs from extending the reach of these technologies and products and services they create to the newer frontiers of human needs to getting ready to service the emerging opportunities according to the skills they can muster.

There are a large number of products, services and technologies looking for newer customers and contribute to the global quality of life as well as the economic pie. Each economic and geographic segment has been responding to these opportunities in ways that are unique to them. How any particular
social formation relates to them greatly influences their present as well as destiny. The Economic Opportunities Commission of WITFOR 2007 explored some of these services and technologies and business models to understand what may impact the developing and emerging economies in the immediate to mid term and zeroed in on the following four where we have tried exploring the possibility frontier.

However, technologies alone do not create any wealth. They need an environment and culture where they help empower the aspirants to succeed. Similarly, with regard to using the power of these technologies to alleviate poverty as well as distinctly enabling environment is a critical pre-requisite. Often the two paths converge. That said, the debate around poverty alleviation has been at a remove from that of creating wealth, As though there were separate paths to achieve the two, much of the contemporary thinking in the developing countries has been divided along the lines of wealth creation being related to markets while government and social space is considered responsible for eradication of poverty.

Seeing wealth creation and fighting poverty as two sides of the same coin may be helpful in creating a joint front towards prosperity, however. For similar policy frameworks can help both tracks move the beneficiaries faster than what can be achieved in its absence or when policies work at cross purposes. This has to be impressed upon both the governments and the donors, who have major impact on how a large number of developing countries create policies and their outcomes.

Going by the success stories from the emerging economies that have succeeded in creating a new world with the opportunities offered by information technologies, private enterprises are the strongest force for the growth of ICT industry. Indian ICT sector has little that is promoted or enabled by the state. Profit motivates people to achieve newer frontiers of prosperity. That may lead to excesses and that is where public policy meets the market forces to temper the excesses of the market place. On the other hand, public policy must also enable people to go the extra mile to realize their dreams. Without an enabling infrastructure and policies that allow people to succeed, there is hardly a way to get people take the next steps. In poverty alleviation framework it is referred to as “capacity building” while the wealth creation model looks at creating the right environment for markets to function well. It is in the ways various societies use the balance between markets and public policy that the story of growth and development unfolds. The maturing of Indian policy making process over the past decade and a half is an example of how a predominantly statist economic regime has
been transformed into a vibrant economic powerhouse in the field of information technologies.

It is often said that the Indian ICT success story is more about government not knowing what was happening and that kept it from coming in the way of enterprising spirit of its technologically capable segment of young people. Many developing countries have not had an opportunity to build the technology education infrastructure, a process that was started in India half a century ago, and may yet lack a community of experts and entrepreneurs that may take advantage of emerging opportunities. Taking a cue from the Indian story, other governments may enable private sector through legislation, regulation and other policies and recognize that the competencies and their acquisition improves with the size of companies and market. They should let the ISPs, the internet service providers, have a level playing field and compete with no barriers to entry into the industry.

Now there is ample evidence in developing countries that telecom market flourishes with competitiveness. They need to lay the foundation of policies that respond to the needs of new technologies and let them flourish. For example, in order to support e-commerce, the governments must create the foundation for secure transactions, offer fair competition on internet gateways and respect intellectual properties as well as emerging alternate frameworks as currently the two markets still may not overlap and watch out for policy needs that will encourage entrepreneurship. They should allow digital transaction and write them into their laws, not blame the ISPs for the legality or lack of it of contents carried on their networks and so on. Moreover, the governments in developing countries need to build policy development capabilities that help growth and development rather than control that may have counter-effects.

Some of the technologies that can help boost the growth process, like in the case of cell telephony, include mobile commerce, locally available services by means of internet such as local versions of the likes of Craig’s List, reverse auction capabilities, collaborative models of technology use and watch out for various new models of technology enabled services that will continue to emerge over time at increasing pace. Most of them may cater to various niche markets and explore what may be viable locally in each economy and the like. A key role of governments in these situations may be to understand what will enable these technology based services to create value in the local environment.

The economies of the developing countries have serious opportunities to quickly move into the information economy that can set aside the earlier
linear or sequential models of growth and development. The fact that technology gap between the industrial/information economies and the developing economies has effectively shrunk from a few decades to a few months will not help unless the developing countries have the capability to benefit from it. In the world of web, a key component of asymmetry, namely information, has been greatly leveled to the benefit of anyone who can use it to create value. However, moving further up the value chain will require deeper expertise, larger size, capability to manage dynamic challenges in the marketplace and quickly moving up the experience curve. Collaborative technologies begin to pay off further up this curve as economies move from the scarcity of tangible assets to the abundance of intangible ones.

3.3. **Emerging Collaborative Tools**

If paper created islands of information, ICTs have been bridging them, slowly but inexorably. From a single page document to joint editing, sharing across networks, groupware etc to the emergence of web is a long story of how ICTs have been bringing closer the end-users. Not long ago, a website was created by someone, maintained by someone else and used by yet another set of people. Emergence of Wiki changed all that. Epitomized by Wikipedia, it has opened up a whole new world of possibilities for collaboration among people and these new constructs are changing the way both social space and the corporate world operate.

Conceptually speaking, wiki seems to have lowered the barriers for most common users to become a creator of our own web based information, knowledge and retrieval processes. So far, those controlling the websites have been the ones with specific knowledge of tools and techniques. Wikis have extended the frontier of technology to a larger cross-section of people who need little specific training to pursue their goals in creating and sharing information and knowledge. In other words, to create a web presence or update it, a common person need not go through specific mark up language training and yet seamlessly create documents that can be accessed all across the cyberspace. In some ways, it takes care of the translation problem that currently exists in getting any content to the website, reduces the time elapsed as it need not pass through an intermediary web-manager or developer and makes the “webification” more inclusive an experience for all those who wish to contribute. Much like Sanskrit and Latin becoming a commoner’s language and turning into Hindi or English respectively. Or like the Mainframes giving way to the PCs or PCs creating space for palm tops.

Wikis level the playing field even further. In a way further “democratizing” the process of designing a website as anyone can take part in creating and editing a wiki page. But that also makes a wiki content dynamically evolving
and potentially always in a state of change. Its simpler writing and formatting rules can be easily learnt by anyone interested in it and that may impact the growth the web designers and creators as we have seen over the past decade. Potential to engage anyone in updating wikis can create much greater participation both within an organization and across the reading and writing population, covering the entire participating population. Though some large organizations do not want their employees to participate to the development of wiki content for reasons of legal, conflict of interest or disciplinary reasons, wikis offer considerably greater capability to create community resources than any other tool invented so far.

It took Wikis a few years, in technological terms a couple generations, to burst on the center stage of webworld. Mostly due, in large part, to the growing popularity of wikipedia, an encyclopedia created by the online community. Allowing any and all to create, add to, or edit any entry has meant that some of the more popular Wikipedia entries have been edited hundreds of times by scores of different people. A wiki allows a group of people to collaboratively develop website with no knowledge of HTML or other markup languages. These people may not know each other and yet may work together to create, update and maintain a website. Named after a Hawaiian expression meaning faster or quicker, wiki was a name its founders gave to a tool they developed for rapid collaborative development of websites. Over time, its potential was seen in helping collaboration among groups and communities where everyone could be a potential participant. Opening up the updating capability to all participant gave it a dynamic framework, something that can be very useful in communities of diverse cultures, where people still use a third party to write letters, where the possibilities of organized and structured approaches of the industrial revolution have not found a home yet and where we are not yet clear about the differences of nuances or perceptions. In other words, a wiki based document that is visited by its intended community is likely to represent theoretically a greater consensus than a web-manager administered content.

That said, wiki is a tool that will be used differently by various groups and the value will lie in how they use it and to what goals, purpose or effects. It does open up a whole host of possibilities and in ways like web offered a new world a decade ago, they have begun unfolding a new promise. However, that does not guarantee that it will change anything for those who cannot master this technology.
3.4. Changing cultures

Cultures are usually much harder to change than technologies demand. Technologies that are easy enough to use find greater acceptance as they lower the barriers to cultural change. In more ways than one, wikis may change the culture of how we look at any publishing activity. Normally we presume that someone will take the ultimate responsibility for what is written or published. In using wiki we end up suspending this belief as everyone has the capability to correct that document in ways they feel comfortable. The next moment someone else may offer yet another opinion. In other words, what is contestable will seldom be static. It can be difficult for people to get used to the idea of a website that anyone is allowed to add to or edit. In other words, as wikis gain ground the idea of a website being a protected territory may take a beating. Taken to the next stage, these ideas may impact the whole concept of ownership as well. So while even entering someone’s website is currently considered hacking, in wiki its a normal practice. Websites have designated people who maintain and update them. With wikis no one is the final arbiter. If the readers don’t like what someone put into the wiki, they can change it. And if someone does not like their input, they may alter the last editors contributions as well. This potentially paves the way wiki will develop organically to reflect the interests and needs of the group who worked on it.

Wikis are the contemporary way of collaboratively developing a website, but they are not suitable for every web-based project. While some websites might benefit from the insights of the community, others function better under tighter control. It’s a great tool to bring outside in.

One of the much discussed ways to use Wikis productively is in the world of libraries. With its limited resources defining the developing world, wikis can be readily used to dramatically improve the functioning of whatever library systems they may have, locally, in larger habitats or nationally. It can also help organize information across the subject matters where the local contributors feel left out and learn as they contribute.

Updating libraries to guide the users in far simpler ways than the old world of cataloguing that consumed inordinate amount of time and resources is one of the few readily available and economically rewarding activity communities can benefit from. Subject guides can languish online with dead links to long-gone websites and without links to newer, more useful sites. This may be because the librarian doesn’t have the time to update them or because the librarian must give the updates to someone else who actually puts them on the Web.
Shifting the burden from the arbiter to all of us, the wiki is a helpful format for a guide. Because it can be edited by anyone, patrons can add to the collection of useful resources and can prune away the dead links. It’s a way to develop a subject guide that represents the interests of its users and doesn’t put the entire burden of finding websites on the librarian. Even without asking for user input, a wiki allows librarians with little web-savvy to quickly and easily update the subject guide.

Amazon.com has been a milestone in the way e-commerce works. Wikis can help communities achieve what Amazon does by spending millions of dollars just for virtually free. When users visit Amazon.com, they find book synopses, cover art, and reviews from people who have already read the book. This helps the visitors to better judge if a particular item will meet their needs. Wiki can simplify adding such knowledge freely and share their experiences across the spectrum of their lives that may help everyone in the community to make a better informed judgment and take most experiences from hearsay to a sharable authentication.

Creating a Community wiki that would be a one-stop-shop for community information can, with the input of the entire community, become whatever the community needs it to be. Anyone could add new informative content. The library could team up with other local organizations to develop, maintain and add content to the wiki, but the bulk of the content will come from average member of the community. Opening up a community guide to the public allows a wealth of information to flow in that can make the library’s website a true community resource.

However, like any other technology, using wikis also requires considerable planning. A look at its users suggests that its either popular among the passionate wiki techies or businesses and governments that plan to implement it carefully. For no matter how simple a technology, its value is realized in the way its used to organize work. So like all technologies wikis will impact the emerging markets in myriad ways depending upon, among others, the readiness of the local environment, cultures, resources- both financial and skills based, leadership and the current state of development in general.

3.5. BPO’s

The over 40 percent annual rate of growth of India’s technology sector has triggered many other countries in imitating its technology business model. The latest stage in India’s technological evolution is characterized by what has come to be known as Business Process Outsourcing or BPO. It took India about a decade to reach a point where the country’s name has become
a byword for outsourcing, establishing call centers for mostly American firms, sprinkled in modestly growing ways with occasional confidence expressed by some European and East Asian countries. Before it could consider moving up the chain it had already tried for a couple decades to build global confidence in its capabilities as a software developer.

Call Centers that symbolize BPOs are a result of moving up the curve during the past decade. It required an ability to understand the customer, capabilities to quickly create the infrastructure required to the specifications defined by the customers, an ability to negotiate and communicate with them, operate to the satisfaction of every caller who came to enquire about their accounts, have business agility to respond to the ever changing dynamics of business.

BPOs require greater maturity on the part of the service provider as the customer. Normally the selection of as BPO service provider is based on the risk of engaging them just as the BPO companies look at their capabilities and track record in both providing the service per the contract or a service level agreement as well as understanding and communicating with the customers. It is no longer a function of technical competence where a programmer can write the codes as advised. It puts the organizations in front of the end customer whose impressions of the call center will directly colour the impressions of the client organization in the market.

It is this feedback from the customers that has made many US corporations move away from their fascination for India to Phillipines and Latin America on account of similarity of cultures, lower price points as well as greater willingness on part of these countries service providers to listen to the customers.

To take this path for countries that have not established a name for themselves along the value chain of technology use and development will generally amount to moving up a very steep learning curve. India software service association NASSCOM has relentlessly worked to create greater quality orientation, awareness, standards and has taken a whole range of pro-active steps to move the outsourcing industry to listen to the voice of their overseas customers. A positive policy environment, appropriate tax structure, infrastructure etc are essential to its growth. However, it has also been observed that despite meeting most of these criteria, India’s neighboring nations have not succeeded anywhere near the Indian achievements and the overseas customers prefer to explore Philippines, Brazil, Eastern Europe instead. That is mostly due to the fact that creating the trust of customers takes considerable effort and time. Branding of a nation where names become synonyms for a product or service is a serious business. Associating
Swiss with quality, Italians with design and garments, Paris with fashion, Germany and Japan with Automotive, Japan with miniaturized electronics or China as a place for cheap manufacture etc was not achieved in a day. It required a bit of serious visioning, planning, prototyping, perfecting and productizing before getting to marketing and branding. The Indian story in software and services was not written overnight by jumping on to a bandwagon. Its roots go back to India’s Second Five Year Plan that laid the foundation of developing engineering and scientific skills and was pursued in ways that the nation’s leadership could come to accept as a reasonable next step.

The success of BPO process in some countries has made many developing countries wonder if they could replicate the BPO story. The experience thus far suggests that in order to start a journey on the path of BPO, some of the key considerations must include:

- A capability to building and improving marketable capabilities, services and market knowledge;
- Business information on offshore outsourcing such as training, information on markets, marketing, technology trends, processes, project management, competition, etc.
- An understanding of the company structure clients prefer
- The size of the company and its track record
- The ability of the management to communicate well in the language of the client
- An ability and willingness to invest in adaptations of the services and processes per the requirements of the international market
- A track record on quality management, awareness of environmental and social issues, an attitude to export

The nations aspiring to benefit from BPO must be able to possess broad industry knowledge and contacts in the target market, be accepted by the companies within the sector, play an active role in the sector development, and should have an absorptive capacity to learn at a fast pace.

### 3.6. Telecentres

Telecentres have been a response to innovate on the capabilities that new ICTs offer to provide access to an environment where not everyone can afford access to computing and internet individually. However, collective resources can be aggregated to overcome the barriers to access affordably. They are now being broadly defined as a public place where people can access computers, the Internet and other technologies, and that help people
to gather information and communicate with others at the same time as they
develop digital skills. While each Telecentre is different, the common focus
is on the use of technologies to support community and social development –
reducing isolation, bridging the digital divide, promoting health issues,
creating economic opportunities, reaching out to youths. Telecentres exist in
almost every country, although they sometimes go by different names (e.g.
village knowledge centres, infocentres, community technology centres,
community multimedia centres or school based telecentres”).

Since International Development Research Center of Canada starting a
Telecenter program some 5 years ago, there is a lot more data on how they
have evolved. However, given the efforts being put in them, the resources
required, efforts required and the benefits there from, it is still early to
understand if these are viable on their own. One of the indicators of viability
of any innovative idea is the speed at which private entrepreneurs adopt the
idea. From that perspective, jury is still out on Telecenters. But there are
several lessons the world has learnt along the path of its evolution.

**What have we learned?**

Telecenters require higher levels of skills to start, operate, maintain,
upgrade and provide services to the local users. They are hard to find
locally and its not always easy to bring them from urban areas for reasons of
lifestyle, infrastructure, prospects and sheer barriers to meeting expectations
satisfactorily, besides lower remuneration that reflect the productivity of the
roles. Its easier for larger initiatives that have corporate backing, such as
ITC’s eChoupal to survive and thrive. But smaller initiatives that do not
attain a critical mass remain under resource pressures.

Training people that run these kiosks is not a one-off effort. The
 technologies involved change faster than nearly everything in the local
environments and, besides the question of costs, sheer logistics offers serious
challenges.

To make content locally relevant requires more resources than the project
can afford for reasons narrated above with reference to the skills. There is
little structured date available for local areas and whatever may be available
may not be digitized. Ideally Telecenters are the recipient of the effort of
various layers. Howere, in reality, Telecenters have become the interface
layer with little supporting infrastructure, making both its operation and
content a serious challenge.

The services that offer value are few and for between. Often the pricing has
to be kept in keeping with user’s affordability while the costs relate to the
realities of the global market place. That leaves a big hole in the viability of smaller initiatives.

By its very nature Telecenters depend on a great deal of partnership among various local and regional administrative and other institutions. Those running these Telecenters are left to fend for themselves to build these relationships across governmental, social and market based points of interface. That makes standardization difficult and impacts the economics while offering intermittent operational challenges. Several times, changing the leadership of one local institution can impact the way Telecentres get supported by them.

There are few local peers, if any, for the operators of Telecenters. That makes it a job of passion and commitment to a cause rather than an operational role that can be carried out in a normal course.

There are various estimates of the cost of establishing and running a Telecenter. Most estimates point to about $2000 to establish a Telecenter and about as much to run it for a year to provide nominal services. Often these services have boiled down to computer training, entertainment such as showing movies and a small part of revenues comes from services they are typically started with the promise to deliver.

Telecenters are often plagued with paucity of expertise about the services they propose to offer. It's where networks of practice have developed that Telecenters have gained some viability by aggregating the value of network rather than that of the individual centers.

Going by the experiments in implementing various Telecenter models there are some pointers that seem to be associated with their occasional success. Focusing on prioritizing applications and services offered greatly influences their economics. It's essential that they have a robust network support infrastructure that can meet the local expectations. Partnership across all stakeholders is similarly critical and so is continuous training of the people operating these Telecenters and that must be combined with continuous monitoring of the operations, lessons learnt there from and ploughed back into running them.

In conclusion, in technology, its application to business or the social context, what creates value is the way work is organized. To benefit from these and create economic opportunities societies will have to do what it takes to create value in their environments. However, broad rules of engagements of these technologies are written by the global markets where they are created.
and without a clearer understanding and preparedness to respond to them, little is likely to be gained. Movements such as Open Source thrive on the promise of freeing up from these global rules. However, they also raise the barriers to creating value in the short run. Unless they mature to a point where technology creation can be localized, it's not clear if the benefits from their application could be realized in the developing economies.
4. Education

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Innovative knowledge communities for building capacity in ICT-enhanced education

4.1. Introduction

The current project was initiated in the Southern African Development Community (SADC) region, by the Education commission of WITFOR 2005, with the support of the government of Finland (Senteni, 2005)(Senteni & Taurisson, 2005). The project is based on the principle of co-evolution of social, material and technical factors, innovative learning and knowledge communities considering social and technical processes from a systemic viewpoint, in an evolutionary perspective of education and culture, allowing the building/creation of meaning and capacity through Information Communication Technology (ICT) - based community development and networking.

Its main objective is to mobilise pioneering educators, starting with teachers and teachers trainers:

- to become change agents for the meaningful integration of ICTs in educational and pedagogical daily practices;
- to improve their own professional competence in using ICT in education.

The project proposes a combination of professional development workshops, intertwined with a support network to foster the emergence of innovative learning and knowledge communities. Educators in general, and teachers participate as change agents in the simultaneous reconstruction of educational contexts of which they form a part. In this statement, “simultaneous” means that reconstruction and transformation of the context

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must be part of an ongoing process where daily work and change are intertwined and cannot be dissociated.

The workshops use the Developmental Work Research (DWR) methodology for the training of Change Agents (CA). Collegial support is provided to these communities through the setting up of local (physical) Change Laboratories (CL) (Engeström, Virkkunen et al., 1996), reinforced in the longer term by distributed (virtual) ones, that takes the form of reflective Content, Community and Collaboration Management Systems, so-called C3MS internet portals.

The CL methodology is based on the Activity Theory of work (Vygotski, 1997) for helping actors in contextualising the development of their own work and in optimising the use of resources and outcomes. The CL methodology is an example of DWR, an activity theory based methodology for studying and developing work practices in collaboration between the researcher and the practitioner. DWR and CL have been developed by a group of Finnish researchers led by Yrjö Engeström since the mid 1980s. It is also based on Engeström’s theory of expansive learning (Engeström, 1987).

The method aims at helping work teams or members of an organizational unit to:
- encounter the problems they face in their daily work,
- systematically analyze the systemic causes of these problems, and
- design and implement a new form of activity overcoming the root cause of these problems.

The main role of CAs is to strengthen the positive impacts of training by organising teachers to set up local/virtual communities.

4.2. The professional development project (2004-2007)

4.2.1. Enhancing competence of teachers for integrating ICT in pedagogically meaningful ways in schools and educational institutions.

The rationale for the work of the WITFOR Education commission, in addition to organising the education theme in the conference program, is to mobilise pioneering teachers and teacher educators to become change agents in improving the professional competence of teachers in using ICT through a
professional development project and network. The project aims at establishing a teacher support network and enhancing professional development of teachers and teacher educators through a network of so-called change laboratories.

One of the big challenges of the uptake of ICT in schools on a large scale is the lack of teachers’ competence and confidence in using ICT as a teaching aid and environment. Most commonly used method to tackle this issue has been the organisation of large-scale teacher training programs.

Teachers are invited to attend courses and/or to organise training on site in schools. This aims at strengthening the positive impacts of training by organising teachers to set up local as well as virtual communities called Change Laboratories based on the so called Cultural Historical Activity Theory (CHAT) of work and thus aiming at contextualising the development of their own work and optimising the use of resources and outcomes.

In a systemic view of education, the integration of ICT in teaching and learning from a view point of teacher competences, is a complex issue related and intertwined with other equally complex issues of technology transfer, curriculum development, development and dissemination of teaching and learning materials as well as paradigmatic changes in didactics. All these issues are intrinsically interrelated.

The capacity building of teachers has, however, a certain autonomy allowing to address it independently (to certain extent), assuming the other building blocks are not entirely neglected. Developing ICT competences of teachers can and should be started as early as the first computers are availed for teaching and learning, not much before and not much after neither much earlier nor later. It should be supported by design and provision of software. Last but not least, teachers should not be left alone to cope with the technical challenges like maintaining the computers, software and networks.

Having these external prerequisites in place, professional ICT competence development of teachers can be successful. There needs to be, however, a number of conditions inherent to the training provision prevailing to make the capacity building efforts effective. Firstly, there has to be clear understanding of the accumulative nature of acquiring the new competences for enhancing teaching with the ICTs. Teachers need to become aware of the potential and scope of the pedagogical usages of ICT. Teachers also need to acquire certain practical technical hands-on skills to be able to enter into pedagogical projects and larger-scale integration of ICT into and across the curriculum.
The project makes the assumption that there are national education ICT strategies, implemented effectively enough to provide at least initial ICT awareness to a minimum number of teachers with a minimum hands-on experience locally. Another assumption is that many national teacher education ICT initiatives have not been able to go much further. The third assumption is based on the fairly global experience that the penetration and integration of ICTs into teaching and learning takes long time to mature and progresses in different speeds within schools, between schools, in different subjects and on different levels of education. The differences in the speed of progress depend among other factors on the commitment of the school management, pedagogical leadership, and teachers’ participation in the pedagogical development processes (of their subject domain area). This calls for development measures within schools as well as in a wider context. National goal settings need to be complemented with intra school situation analysis and goal setting.

4.2.2. The professional development model

Enhancing ICT competence of teachers to utilise ICT in pedagogically meaningful ways in schools and education institutions uses the following approaches:

1) setting up a gradually growing number of school-based ICT development groups. This started since 2005 in Botswana and Mauritius, and was continued in the context of an IICBA project in several other African countries. The project will take WITFOR 2007 as an opportunity of expansion in Ethiopia, and eventually other interested countries.

2) anchoring the work of these school-based innovative teachers groups in the activity theory of work and in particular in the development method called Change Laboratories, University of Helsinki being the leading research centre in this field);

3) supporting these school-based groups from outside by:
   a. ensuring that the pedagogical leadership in schools supports the work of the change laboratories through supporting the head teachers; and
   b. supporting participating teachers in the CL activities by resource centres and network. A few resource centres are already in place (e.g. the International Institute for Capacity Building in Africa - UNESCO/IICBA -, the Virtual Centre for Innovative Learning Technologies (VCILT) at the University of Mauritius, the new centre in the process of creation at the University of Botswana with the support of the University of Helsinki.

4) linking this emerging network of school-based change laboratories with other networks of teachers and schools in Africa, e.g. SchoolNet Africa;
5) seeking possibilities for setting up for the teachers and head teachers participating in this activity an institutional framework in the blended Higher Education form a professional development or masters program in ICT enhanced pedagogy through one or several member universities of the consortium.

The professional development model of the project is based on the collaborative development of local and virtual knowledge and innovation communities of teachers by blending work of teachers, learning of students and teachers with innovations. These communities called Change Labs or Competency Labs, will then be networked with other similar teacher communities supported by mentors from national teacher education institutions networked also with a virtual resource support centre and a diaspora of experts, involved from the beginning as partners of the project.

4.2.3. **Change Lab and cycles of expansive learning**

The purpose of the Change Laboratory (CL) method is to help a work team or the members of an organizational unit to encounter the problems they face in their daily work and systematically analyze the systemic causes of these problems and design and implement a new form for the activity to overcome the root cause of daily problems.

In the CL, the cycle of expansive learning can be outlined as follows:

1. **Charting the situation**
   - mirror for questioning the present practice
   - recognizing that something must be done
   - commitment to develop

2. **Analyzing the situation**
   - mirror for analysis, modeling contradictions in the activity system
   - how did we work in the past
   - what are our present troubles and contradictions

3. **Creating a new activity model**
   - how are we going to work next year

4. **Concretizing and testing the new model**
   - what changes do we try next month

5. **Implementing the new activity model**
   - putting first steps into practice
   - pushing the next steps

6. **Consolidating and spreading the new practice**
   - teaching others what we have learned
   - codifying the new rules etc.
Figure 1a: the cycles of expansive learning

Figure 1b: the change laboratories as collegial support
4.2.4. **The creation of a centre for community and school transformation in Botswana (2007- )**

In the above context, a co-operation between the Universities of Botswana and Helsinki has been established in 2007, within the broad area of Cultural Historical Activity Theory. The project targets the following objectives:

i. Application, adaptation and development of the Cultural Historical Activity Theory and the Developmental Work Research methodology in the context of school transformation.

ii. Post graduate training of change agents for school transformation and new uses of ICT.

iii. Developmental research on school and community transformation.

The MOU between the University of Helsinki (UH) in Finland and the University of Botswana (UB) stipulates that both have a shared understanding concerning the steps to be taken to build a long-term collaboration in the use and development of the Cultural Historical Activity Theory (CHAT) in the context of school, community development and teacher education. The Department of Educational Technology (DET) established some working relationship with the Helsinki University through their participation in a World Information Technology Forum (WITFOR) Pilot project that is being implemented in Botswana, yet this has led to the further development of co-operation between the two universities.

The University of Botswana through the Department of Educational Technology (DET) will allocate resources to establish a teaching, research and development centre that will offer a post graduate program and carry out Developmental Work Research (DWR) in schools and in teacher education based on activity theory and this will encompass the SADC region in the near future. Furthermore, the collaboration will facilitate workshops intertwining professional development on pedagogy and content for enhancing ICT competence of teachers thus increasing the efficiency of ICT investment in school systems and communities in Botswana and SADC countries.

The first steps will be to train and support an emerging network of regional trainers, establish a teaching and research center based on activity theory and to initiate developmental work research at the University of Botswana that is intended to attract participants from the SADC region. A major focus of the post graduate program to be offered will include applied research and technology development addressing critical issues for restructuring educational practices through ICTs, and providing local communities with
methodologies and tools for mastering educational and community transformation.

The purpose of the collaboration

The research and development centre will support transformation associated with the integration of ICTs in developing countries’ educational systems and communities, in line with the Millennium Development Goals, (MDGs), and prevalent Information Communication Technologies (ICTs) and innovative policies in Botswana and the SADC region. Vision 2016 and MAITLAMO Policy, and the UB vision and Mission will be a major focus of the activities of this initiative. This will provide Botswana and SADC countries with tools and instruments to help in building individual and collective capacities needed for social and cultural renewal regarding education and other practices in order to develop more productive participation in global economy.

A major focus will be to apply and further develop Cultural Historical Activity Theory (CHAT) and Developmental Research (DWR) as the major vehicles for the development of new forms of educational activity in schools, teacher education and communities.

Within a two years strategic plan aiming at:
- Establishment of a Center of Activity Theory within the Department of Educational Technology.
- Launching a Masters Program to train change agents for school and community transformation.
- Conduct Developmental Work Research in the pilot schools to serve as local content for the Masters Program.
- Hold teacher capacity building workshop/s and training on the use of CHAT to support the WITFOR Pilot project.

The objectives include:
1. Application, adaptation and development of the Cultural Historical Activity Theory (CHAT) and other methodologies in the context of school and community transformation in Botswana and the SADC region.
2. Planning, developing and implementing training to support educational transformation among teachers associated with the WITFOR Education Commission Pilot project launched in Botswana during 2005.
3. Provision of post graduate academic training program of change agents for school and community transformation intended to cater for the SADC region.
4. Conducting developmental work research on school and community transformation.

The project includes other partners to provide the necessary support to the collaboration, such as:
- Ministry of Education (MoE)
- Ministry of Communication Science and Technology (MCST)
- Botswana College of Distance Open Learning (BOCODOL)

The MoE houses the Department of Teacher Training and Development (TT&D) and is instrumental in the achievement of school transformation nation-wide while the MCST is responsible for launching innovative ICT policies that have implications for both school and community transformation. BOCODOL houses the Southern African Development Community Centre for Distance Education (SADC-CDE), which is a centre of excellence in Southern Africa established for the Southern African Development Community (SADC) region. The SADC-CDE will serve as a receptacle from which the collaboration can reach SADC clients with ease. Other such collaborators will be identified with time.

The first step in the establishment of the collaboration has been for both Universities to sign Memorandum of Understanding (MOU) outlining the nature of the nature of the collaboration. The Centre for Activity Theory and Developmental Work Research in the University of Helsinki and The Department of Educational Technology and Helsinki University have proposed to develop a two (2) year plan that will provide a detailed program of activities to be undertaken. This engagement will also need input from the Botswana based Activity Theory group that was constituted during WITFOR 2005.

This initial part of the collaboration is being supported and funded by the Academy of Finland for 2007-2008. The second phase of the funding has implication for the collaborators to solicit funding in liaison so as to make the collaboration sustainable of the program from 2009 and beyond.

Both universities will seek to allocate funds for the activities described above collaboratively and third-party funding may be sought, where available.
4.3. A network of innovative communities for learning and knowledge building

As shown in Figure 2, the project is organised as a complex system, whose interacting and overlapping components and lines are practice, training, research and networking. The system itself as a whole, is an innovative learning and knowledge community that can be described as follows:

4.3.1. Communities of practice

Communities of practice (Scardamalia & Bereiter, 1996) (Wenger, 1998) foster social learning and knowledge advancement by focussing on dynamic processes of knowledge transformation. This knowledge-creation metaphor of learning emphasizes the importance of going beyond information given (Paavola, Lipponen & Hakkarainen, 2004). Communities of practice are sense making, knowledge creating and decision making organisations, promoting structured, activity-based, project-oriented learning (Schneider, 2005). We assume that knowledge creation is supposed to emerge, be shared and distributed at all level of scale, from school communities to the distributed change lab.

Figure 2: the project layers
4.3.2. **Teacher development through collective teaching activities**

According to long term experience in many countries such as Canada or Switzerland, teachers too often, do not make creative and effective use of ICT, despite substantial investments by the system. Schneider (2005) makes the claim that vocational teacher training ought to engage teachers as reflective designers of their own ICT practise. Training agendas should focus on the teachers' learning process itself and not just on the desired output, i.e. teachers can't just be told or shown how to teach with ICT. ICT initiatives and somewhat chaotic pedagogical reforms unable to clearly associate new ICT-based instructional strategies with pedagogical goals add to the problem. In the worst case, the simple fact that very different pedagogical strategies and methods are needed for the diverse range of learning goals, learning types, content types, institutional settings, etc. is not understood. In the best case, teachers and educational policy makers alike have trouble dealing with the so-called "soft-skills" or "knowing-in-action" modern society requires like the ability to design things, to do projects, to solve open problems, to discover principles from empirical data and so on.

Schneider discusses a conceptual and technical learning environment framework for activity-based pedagogical scenarios. This framework engages teachers in platform configuration and scenario design. It also may include built-in teacher-development facilities. Initial findings from our various field experiments at all school levels (from primary to post-graduate) indicate that training strategies engaging teachers as well as tutors in the design of collective teaching activities had a positive effect on creative and pedagogically beneficial use of ICT.

4.3.3. **Project-based pedagogy**

According to Taurisson (2005), the traditional organisation of a class organised around a teacher animating, interacting and teaching, offers little opportunities for adaptation, allowing to cope with the increasing complexity of any real educational situation. Pedagogy for structuring a social and heterogeneous community of learners, is based on the following principles:

- student forms part of the project;
- student builds up meaning by being aware of her/his actions inside the community and of her/his own progress towards a targetted competency;
- student can use a large scale of mediations;
- student can use tools,
  - tools can be either material, virtual or conceptual,
• tools are a part of activity, used in relation with other components of activity,
• tools improve production, communication and knowledge;
• student collaborates to achieve the object of activity. Collaboration allows students of various levels to work together.
• Communication is an integral aspect of the activity.

4.3.4. Institutional framework and collaborative resource centres

The following question is central to the project: “Can teachers, as a collective, create in their school a sustained movement that turns available ICT tools into locally grounded means and infrastructures of serious pedagogical change?” (Engeström R. & al., 2002). Can teachers be involved into new pedagogical practices, and select pilot topics and curriculum units in which they applied ICT to facilitate pedagogical change from below. The project explores ICT-enhanced pedagogies through a scenario where students have to report their daily practice into a personal / community / network digital diary, available through the technological platform, to be used as material on which to reflect in a collaborative manner.

Beyond the limits of the classroom, local activities are articulated with networked ones, bottom up collaborative building of resources with top down training initiatives, autonomous activity of the classroom with institutional support.

Pedagogical resources are available from different sources:
• tools and platforms developed since 2001 at the Virtual Centre for Innovative Learning Technologies (VCILT) of the University of Mauritius;
• resource centres and emerging local resources (IICBA, VCILT, UB, etc);
• widely available Open Educational resources (OER).

The collaborative resource centres offer not only built-in teacher-development facilities but it also engages teachers in the active development of resources as well as in the design and practice of collective teaching activities.

4.4. The Distributed Change Laboratory (DCL)

The Distributed Change Laboratory (DCL) is a qualitative research project for assessing the relevance of the Change Laboratory (CL) methodology in an African context. The main objective is to adapt the CL methodology to
the context of developing countries and to apply it over the network of communities of the WITFOR Education Commission project, as a collegial support framework supported by an internet community portal.

An impressive number of what the authors coin C3MS (Community, Content and Collaboration Management Systems) spring into existence. Inspired by personal Weblogs (also called blogs), slashdot-like Weblog/news systems, simple content management systems and various popular groupware applications, they offer a modular system for «configuring» interactive community Web-sites. Moreover, most of these systems provide documented extension mechanisms allowing third party persons to contribute some modules with additional functionalities (Schneider & Synteta, 2003).

C3MS systems are a form of Web portals. A portal gathers a variety of useful information and communication resources into a single, «one-stop» Web page. A portal therefore is a collection of objects (information bricks) and services (operation on these bricks) that can be accessed from the portal (Web) page. When the user works with a specific resource, (e.g. a collaborative hypertext), only a part of the interface changes. Therefore, a portal is a kind of «cockpit» where the central views changes, but the other instruments can be reached. Portals can be adapted for specific communities and sometimes users can tailor them to their needs. Moderately sophisticated systems like PostNuke offer a good set of core portal functionalities out of the box, such as a good user administration system, a news/journal system, Web links sharing, search, FAQs, Polls and more. In addition, an impressive amount of extra modules (many from autonomous developers) like collaborative hypertexts (Wikis), pictures galleries, simple content management systems, calendars of events, chats, project managers, file-upload, glossary management are available. Many Web-applications popular in education that existed beforehand as stand-alone applications (e.g. Forums and Wikis) are adapted for a better integration. Specific pedagogical applications based on the needs of teachers exist and others are being developed, e.g. by our own research team.
4.5. Conclusion and reflections on the change process

The concept of change is usually reserved to structural long-lasting transformations of an activity system, whether in a complex organisation, in a group or an individual (Gather-Thurler, Perrenoud, 2003). One of the goals of WITFOR in general, and our project in particular is to open a space for expansion, along with, when needed, (re-)negotiation and change of obsolete inefficient process. Obviously, the work undertaken by the Education Commission cannot become sustainable without, in parallel with individual change of mindsets, a gradual change occurring inside traditional institutions and structures (schools, TEIs, etc). The role of the change labs is to train a task force of CA, acting in their own school/college/training institution as a collegial support informal mechanism to plan and monitor the implementation of activities as per schedule. Change agents act both locally to foster empowerment, progress and quality, and also through a distributed change laboratory, embodied in the community portal. This type of framework, currently under development at the VCILT is inspired from a similar network implemented by the NTAC, in the USA.

Change is an ongoing process, not a short-term event. Change requires ongoing support and resources and it takes time. "Most changes in education
take three to five years to be implemented at a high level. Failure to address key aspects of the change process can either add years to, or even prevent, successful implementation." (Hall et al., 2001). Change occurs in individuals first, then in organizations. Individual change is difficult if the organization is not supportive of the change.

People go through change at different rates and in different ways. You can't expect everyone to be ready at the same time to implement or even to choose a program. Some people need more information to be convinced. Some need more training to feel prepared. As people implement a new program, their concerns change. For example, when teachers first hear about introduction of ICTs for enhancing education, they might not be concerned because they don't think it will affect them. However, once they realize that they will be the ones implementing it, they may have concerns about how to fit the program into their already busy schedules.

The effectiveness of the whole capacity building framework - combination of structural and individual reflective practice - relies on the implementation of these change labs, led at grass root level to train a task force of "change agents", acting in their own school/college/training institution as a quality assurance informal mechanism planning and monitoring the implementation of activities as per schedule. Change is an ongoing long-lasting process, requiring ongoing support and resources and taking time. The change agents would then be the actors and supervisors of gradual changes inside their own traditional institutions and structures (schools, colleges, TEIs, etc), thus making the work undertaken more sustainable.

4.6. References


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5. Empowerment and participation

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ICT-Enabled Participation for Empowerment

5.1. Introduction

The knowledge society in which we live today has been catalyzed by Information and Communication Technologies (ICT). The old adage that having information is power has been fast losing its relevance. What counts today most is our ability to not only having information but exchanging and sharing the information with one another from which we can make sense for mutual benefits. When citizens of a nation participate in ICT-based activities and are able to gain timely access to relevant information, that citizenry can be characterized as being informed. According to the World Bank, informed citizens are “better equipped to take advantage of opportunities, access services, exercise their rights, negotiate effectively, and hold state and nonstate actors accountable” (World Bank, 2002) (p. 15).

ICT being a key enabler of information exchange and sharing, one will expect that with the rapid pace of advancement in science and technology, the collective power to undertake activities of mutual interest should be growing exponentially. While this is a reality in most developed nations, it remains an illusion in many parts of developing country environments where access to, and participation in electronic communication networks remains very limited or is even completely absent.

The inability to gain access to, and participate in electronic communication networks has been eloquently described as the digital divide. The reality of the digital divide in developing country environments is reflected in the helplessness of individuals in these environments as they face the numerous challenges of today’s information and knowledge intensive society.

The empowerment and participation (EP) commission of the World Information Technology Forum (WITFOR) recognizes the potential of ICT to mitigate and transform the helplessness abilities of individuals into helpfulness abilities. We refer to the processes associated with such

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transformations as ICT-based participation, the result of which is the empowerment of individuals to explore and exploit ICT for their socio-economic wellbeing in the widest sense at the individual, organizational, and community level. Invoking ICT-based participation as a precursor to, or determinant of empowerment is a direct response to the recurrent themes of the three WITFOR conferences so far: **ICT for development and prosperity**, WITFOR2007, Addis Ababa, Ethiopia; **ICT for accelerated development**, WITFOR2005 held in Gaborone, Botswana; and **ICT Equity**, WITFOR2003 held in Vilnius, Lithuania.

The rest of this chapter is organized as follows. In section two, we present the broad orientation of the EP commission. In section three, we present some mechanisms for the empowerment of a specific group of individuals – youths. In section four, we briefly present some ICT-based participation approaches for empowerment. Section five presents a proposal for the conduct of research to better our understanding of the relationship between empowerment and participation. Such research will provide data and indicators for policy and decision makers regarding ICT-based participation and empowerment of the various groups of individuals in developing country environments. Section six concludes the chapter with emphasis on the challenges associated with empowerment and participation as well as recommendations for policy and decision makers.

### 5.2. Broad Orientation of the Commission

The broad orientation of the EP commission has been to identify and promote initiatives that focus on the empowerment of citizens through citizens’ participation in ICT-enabled activities. Such participation, we believe offers the opportunity for citizens to gain access to, and acquire the information and knowledge for use in the improvement of their socio-economic wellbeing. While information can easily be obtained through access to, and the use of computer mediated technologies, knowledge is certainly the result of situated learning and communication exchange among participants within the computer mediated network of humans at individual, group, organizational, and community levels.

Based on the foregoing orientation, the EP commission therefore proposes and calls on governments and industry leaders to consider the following as pre-requisites steps for effective and sustainable empowerment of citizens through their participation in ICT-enabled activities:

1. Formulate, introduce, and support appropriate policies for universal access to, and participation in ICT-enabled activities. Such policies must be aligned with local, national, and international realities.
2. Develop and deploy sustainable low-cost community user information and knowledge management systems. Information kiosks and Internet cafés are some examples of operational initiatives in various countries but the key here is low cost and sustainability.

3. Promote electronic business (e-business) in all its forms, ranging from e-government which includes e-governance and e-democracy to the encompassing set of e-related activities including but not limited to e-commerce, e-health, e-education, and e-service at large.

4. Identify the appropriate target citizen group to be empowered in order to tailor the ICT-participation activities accordingly. Examples of specific groups that are to be considered include women, youth, unemployed, and the disadvantaged such as ethnic minorities, refugees, those living in rural and isolated communities, those living in slums, the elderly, and the disabled.

5. Revisit the aid donor and receiver arrangements between developed (donors) and developing (receivers) countries to recognize and emphasize that providing funds and setting up ICT-related structures does not really empowers the recipients. As ICT is a means not an end in itself, the key to empowerment is getting the recipients to participate in ICT-related activities from the initiation through development, use, and maintenance.

6. Embrace, explore, and exploit the potential benefits of learning and support among developing countries in ICT-based participation for empowerment. When it comes to ICT matters, a number of developing countries are relatively more advanced compared to others. Rather than expecting to get onboard only with support from developed countries, developing countries that are trailing in ICT-related matters should not be shy to ask for assistance and collaboration with the relatively more advanced developing countries. Equally, the more ICT-based advanced developing countries should stretch their hands to support the other less advanced countries, for example, through replication of successful projects and joint experimentation in ICT activities.

The overarching perspective of the EP commission can be summarized in one question – how can ICT be used to empower the various groups of individuals identified above (empowerment entities) so that they can meaningfully engage in activities to better their socio-economic wellbeing?

5.3. Specific ICT-Enabled Participation as the Basis for Empowerment

Even though there may be some overlap, the different empowerment entities identified above require different mechanisms for ICT-enabled participation. This is because each target entity or group has a different learning curve
when it comes to mastering ICT. In addition, the needs of each entity or group are different from those of others. The United Nations Educational and Scientific Organization proposes the use of the following measures or mechanisms for empowerment (UNESCO, 2002):

1. Promote access to global information and knowledge on things that impact the lives of youths, so that youths can participate and make appropriate socio-economic choices.
2. Train youth in the use of ICT and improve access to education through face-to-face and distance learning approaches and the use of community multi-media centres.
3. Involve youths in the development of guidelines for the creation, access, use, and disposal of information, including ethical considerations in cyberspace.
4. Engage youths in the generation of local content and indigenous content.
5. Facilitate the wide use of free and open software for training and education.
6. Design and implement programs such as fellowships, contests, and competitions that will provide for meaningful access by youth to information and knowledge resources.
7. Promote measures and programs to enable participation of disabled and handicapped youth in ICT activities.
8. Cultivate creativity for youth and promote access to ICT-related careers.

Due to inevitable differences among empowerment entities, it may be ideal to develop and implement specific mechanisms for each empowerment entity. However, a critical look at the youth empowerment mechanisms proposed by UNESCO reveals that it is possible to tailor or map the mechanisms to meet the needs for other empowerment entities. For example, consider refugees as an entity to be empowered through their participation in ICT-based activities. The UNESCO mechanisms are immediately relevant to refugees since they are disempowered vis-à-vis ICT-based participation as discussed below.

By virtue of their conditions, refugees are not able to make appropriate socio-economic choices (#1), they may not be trained and often do not have access to education (#2), they are not involved in the development of guidelines for creation and use of information content, and may not be aware of cyberspace ethics (#3), they do not participate in the creation of local and indigenous content (#4), they may not be exposed to free and open software as a result of #2 (#5), and they are unable to participate in scholarships, contests, and competitions associated with ICT-based programs (#6). While #7 may or may not be applicable, refugees are in dire need of opportunities to cultivate creativity and pursue ICT-based careers (#8).
5.4. ICT-Enabled Participation “Best Practice” Projects

In this section, we present a number of ICT-based projects and approaches within which participation leads to empowerment, not just of the individuals but of the community at large. The specific best practice projects identified could be related to E-Services, ICT Industry and Public Sector initiatives, and ICT Economic-related Opportunities.

An elaborate but non-exhaustive search by the EP commission resulted in the identification of several projects under the above categories from both developed and developing countries that can be cited as ICT-enabled participation “best practices” for empowerment. For the purpose of this chapter, we briefly present those projects whose directors/project managers have attended and presented the projects at WITFOR2007 conference. Further details on these projects can be found on the WITFOR website http://www.witfor.org

**Community Multimedia Center Scale-up (CMCS) Senegal:** The focus of CMCS Senegal is to establish sustainable networks of community multimedia centers in Senegal and the engagement of communities in ICT-related activities within the centers. The CMCS is combining community radio and telecentre facilities to provide ICT-based services that strengthen and empower communities to fight against poverty and HIV/AIDS. The contact person is Fatoumata Sow, Email: f.sow@unesco.org

**Knowledge Transfer Beyond Boundaries (NABU) Cameroon:** The focus of NABU Cameroon is the empowerment of rural communities in Cameroon in their fight against HIV/AIDS using ICT. Essentially, NABU is working to make HIV/AIDS-related information available and accessible to the rural communities in digital form through ICT. In engaging the rural communities in ICT-based activities, NABU is contributing to the elimination of the digital divide and the prevention of HIV/AIDS in Cameroon. The contact person is Louis-Marie Ngamassi, Email: Ngamassi@yahoo.fr

**Opportunities and Challenges of ICT for Youth Development-Policy and Program Implications for The Ghana ICT4AD Process Ghana:** The focus of this project is the exploration of opportunities and challenges associated with the engagement of youths in ICT-based activities in Ghana. The project is investigating current use of ICT by youths in Ghana with the expectation of identifying policy gaps and the potential of ICT for regular education,
continuing education, and employment of the youth. The contact person is Nelson Agyemang, Email: agyino@yahoo.com

**Rural Decision Support System (RDSS) Project India:** The focus of RDSS India is the engagement of farmers, artisans, and rural youths and women in India in the use of ICT-based activities through which they can get and share relevant information and become empowered in the utilization of available resources for socio-economic wellbeing. The RDSS project is facilitating various linkages for socio-economic activities including employment, business development services as well as reduction of the digital divide in India. The contact person is Rajendra Mahatma, Email: raj_48@sancharnet.in

**Southern Illinois Radio Information Service (SIRIS) in USA:** The focus of SIRIS USA is the provision of reading and information services for the blind, the visually-impaired, and the print-disabled individuals. Using the IN TOUCH Network, SIRIS is providing 24 hour daily services to these individuals. SIRIS is bridging the digital gap by enabling those with limited capabilities to participate in ICT-based activities, thereby keeping them informed and empowering them to pursue other activities to improve their socio-economic wellbeing. The contact person is Vickie Devenport, Email: vickie.devenport@wsiu.org

**Telecentre.org Project in Canada:** The focus of the Telecentre Project is the improvement of the capacity and sustainability of telecentres around the world. Operating in nine countries as of this day, Telecentre is working to increase the socio-economic impact of telecentres for grassroots communities through provision of resources such as local content and learning and networking opportunities. The overall approach of Telecentre is to ensure increased availability of value added services for communities through the telecentres, thereby empowering the communities to pursue activities for the improvement of their socio-economic wellbeing. The contact person is Meddie Mayanja, Email: mmayanja@idrc.ca

### 5.5. Assessing the Impact of ICT-Participation on Empowerment – A Research Proposal

#### 5.5.1. Introduction

During the first WITFOR conference in 2003, several calls were made, including one to undertake “research in the area of how people and ICT interact and how they [people] live with the ever-developing technology.” (Sloane, 2003)(p. 329). Four years have elapsed and WITFOR is meeting in
2007 for the second time after the call, but to our knowledge, there is no record of any such related WITFOR research. This proposal is a partial response to the call made in 2003 for WITFOR research. The proposal is for research relating ICT and empowerment and participation.

Empowerment and participation are concepts that have traditionally been studied in the management- and health-related fields. As a relatively new concepts in the information technology (IT) field, claims of the potential benefits of ICT empowerment and participation of specific groups have to date relied on anecdotal information. However, to be able to formulate veritable policies and make appropriate decisions to address issues of ICT empowerment and participation, policy makers need a data-driven approach. A data-driven approach requires the conduct of empirical studies to provide the requisite data for policy and decision-making processes.

Moreover, discussions on empowerment and participation in the IT field are based on the implicit assumption that individuals, groups of individual, organizations, and communities have to be empowered to participate in ICT-based activities in order for them to reap the benefits of ICT. In other words, the assumption is that the relationship between empowerment and participation is one in which empowerment leads to participation. Although this assumption has merit in view of the fact that the empowerment and participation relationship can be considered as bi-directional, i.e. empowerment leads to participation and participation leads to empowerment (Speer and Hughey, 1995; Kieffer, 1984), more recent studies indicate that it is more logical and appropriate to consider that participation leads to empowerment (Peter and Hughey, 2004).

We uphold the unidirectional relationship in which participation leads to empowerment and make this research proposal with the purpose of assessing the impact of ICT-based participation on empowerment. Upon realization, WITFOR research objectives would have been met in addition to providing the relevant data needed for data-driven decision making by policy makers.

5.5.2. Research Questions and Rationale

The research will be carried out to answer the following primary question:

1. What is the impact of specific ICT-based participation on the empowerment of specific target groups of citizens for the attainment of specific goals and objectives?

The relevance of this primary question can be appreciated from two perspectives. First, unlike developing country environments where the
digital gap is being reduced on a daily basis, the gap is widening on a daily basis in developing country environments. Therefore by emphasizing ICT-based participation in developing country environments, it is hoped that the digital gap could be bridged while attaining the greater benefits of empowerment. Second, limited resources (financial, technical, and human) or complete absence of some of these resources in most developing country environments dictates the need for well-thought, sensible investment strategies for the deployment of resources if the elimination of the digital gap in these environments is something to be achieved. In other words, by seeking answers to the above question, it will be possible to align and expend resources only on those ICT-based activities that have the most potential impact on the empowerment of specific target groups for the achievement of specific goals and objectives.

In addition to the foregoing primary question, the research will look at the following secondary questions:

2. What are the critical success factors (CSF) for specific ICT-enabled participation by specific target groups of citizens for the attainment of specific goals and objectives?

3. Under what conditions does engaging in specific ICT-enabled participation empowers specific target groups of citizens for the attainment of specific goals and objectives?

4. To what degree does engaging in specific ICT-enabled participation empowers specific target groups of citizens for the attainment of specific goals and objectives?

5. How does the empowerment of specific target groups through their engagement in specific ICT-enabled participation varies across different regions (villages, towns, cities, provinces, countries) of developing country environments?

By carrying out research to answer the primary and secondary questions, we will obtain pertinent data that will enable us compute what we call the ICT-Participation for Empowerment Index (IPE Index), defined as the degree of entity empowerment resulting from participation in ICT-based activities. As the IPE Index will be computed at local, national, and regional levels, it will serve as a useful indicator to guide resources allocation and investments based on its comparison for different ICT-based activities, different empowerment entities, and different regions.
5.5.3. **Theoretical Background and Research Model**

*Empowerment*

Empowerment is viewed from the management literature as a situation in which top management delegates or assigns tasks to subordinates thereby empowering them to do what they would not normally do, though with the objective of ensuring organizational effectiveness (Burke, 1986; Block, 1987). The empowerment concept has also been used to address issues of the powerless of minority groups such as women, black, and those handicapped (Conger and Kanungo, 1988); and has been widely used in the health field to refer to gain in power, i.e. the ability to act and create change in a desired direction (Bernstein, Wallerstein, Braithwaite, et al., 1994).

Even though empowerment is viewed in management terms as a relational situation in which management share their power with subordinates, of relevance to this research is the view and distinction of empowerment as a process and/or experience (outcome). Empowerment as a process is linked to participation in the sense that targeted empowerment entities must be recipients of an ongoing training and technical assistance program (Bernstein, Wallerstein, Braithwaite, et al., 1994). Translated for this study, this means ongoing training and assistance on the use of, and involvement in ICT-related activities. Empowerment as an experience or outcome implies the possibility of the empowerment entity to sustain its positive efforts derived from ICT-based participation across several years with visible gains in its socio-economic wellbeing. Other views of empowerment include motivational and self-efficacy (McClelland, 1995; Conger and Kanunga, 1988; Bundara, 1986). For ICT-participation to lead to empowerment, empowerment can be viewed as motivational, whereby conditions are created for heightened motivation for task accomplishment through the development of a sense of personal efficacy (Conger and Kanunga, 1988; McClelland, 1995) and effective execution of ICT-related activities geared toward the improvement of socio-economic wellbeing. Besides regarding empowerment in motivation terms, it is also valuable to create conditions wherein members of the empowerment entity group can develop/believe in the enhancement of their self-efficacy, i.e. strengthening of the belief of their powerfulness or weakening the belief of their powerlessness.

When viewed from the perspectives of the various entities that can be empowered, discussions have focused on three empowerment levels: individual, organizational, and community. The understanding is that individual empowerment refers to “an individual’s ability to make decisions and have control over his or her personal life” (p. 152); while organizational empowerment means an organization is democratically managed and its
“members share information and power, utilize cooperative decision making processes, and are involved in the design, implementation, and control of efforts toward mutually defined goals” (p. 152); and community empowerment means individuals and organizations in the community can “apply their skills and resources in collective efforts to meet their respective needs.” (Israel, Checkoway, Schulz, and Zimmerman, 1994) (p. 153). Rowlands (1997) also advocates for empowerment at three different: personal, relational, and collective. According to Rowlands, empowerment at the personal level involves a sense of self-confidence and capacity. At the relational level, empowerment implies the ability to negotiate and influence relationships and decisions while at the collective level, empowerment entails collective action as at the individual and relational levels.

The concepts of empowerment and participation have also been used and applied by international organizations including the World Bank (WB), United Nation Children’s Fund (UNICEF), United Nations Development Program (UNDP), and the International Fund for Agricultural Development (IFAD) in very specific contexts. The WB has applied the concept in regards to poor people, defining it as “the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives” (World Bank, 2002) (p. 11) and emphasizing that empowerment shares four elements: access to information, inclusion and participation, accountability, and local organizational capacity. UNICEF has looked at empowerment from a women’s perspective, and has developed the Women’s Equality and Empowerment Framework in which emphasis is placed on access to resources, awareness of the causes of inequality, participation and capacity of women to direct their interests, and ability to take control and action to overcome barriers and other obstacles that hamper the reduction of structural inequality (UNICEF, 2003). Related work on women’s empowerment has been conducted by Kabeer (1999, 2001) where emphasis has been placed on three dimensions defining the capacity to exercise strategic life choices: access to resources, agency, and outcomes. The UNDP has embraced empowerment from the perspective of inequalities in economic and political participation of individuals, decision-making power, and power to control resources (UNDP, 1995). IFAD has adopted empowerment to include both access to productive resources as well as the capacity to participate in decision making processes that affect the least privileged (Popular Coalition to Eradicate Hunger and Poverty, 1995).

Based on the foregoing, we adopt a working definition of empowerment as “the ability of people to gain understanding and control over personal, social,
economic, and political forces in order to take action to improve their life situations” (Israel, Checkoway, Schulz, and Zimmerman, 1994) (p. 152).

**ICT-Participation**

In this study, we define ICT-participation broadly to be the involvement of an entity in any ICT-related activities, i.e. e-services in the widest sense. Examples of specific ICT-based activities include but are not limited to e-governance, e-democracy, e-health, e-education, e-commerce, etc.

**Research Model**

We draw from the theory of learned hopefulness (Zimmerman, 1990) to propose a research model for the study of the relation between ICT-participation and empowerment and ultimately the assessment of the impact of ICT-based participation on empowerment. According to the learned hopefulness theory, processes and experiences that provide opportunities to learn skills and develop a sense of control can help individuals minimize the weakening effects of problems in their living (Zimmerman, 1990). Our assumption is that by participating in various ICT-based activities, various entities will be empowered accordingly so as to be able to address socio-economic problems for the betterment of their wellbeing. A high level general but simplified research model for this study is presented in figure 1.

The general research model of figure 1 depicts various types of ICT-participation as the independent variables and three dimensions of empowerment as dependent variables. In addition a number of moderating factor such as age, gender, income, life-style, and educational level are included in the model as moderators. From the general model, more specific research models will be developed linking one or more ICT-based activities with each empowerment paradigm and for a specific empowerment entity. For example, one more specific model will involve relating e-governance with organizational empowerment with women being the focal empowerment entity.
5.5.4. Methodology

The choice of women in the first study will opine on the various women-related studies carried out by UNICEF and UNDP. As the UNICEF and UNDP studies do not explicitly include ICT, we will further opine on lessons learned from the developed and developing country environments on women’s involvement in, and use of ICT-based activities. The initial study will therefore involve women’s organizations in select geographical regions of developing country environments. Data will be conducted through a survey, using the traditional snail mail approach and supplemented with web-based and email approaches as may be possible. Relevant existing scales will be adapted for use in the measurement of the constructs of the model following an initial pilot test.

For the case of an initial study focusing on assessing the impact of ICT-based participation for the empowerment of women in Africa, the research will build on existing studies such as The African Gender and Development Index (AGDI) study conducted by the Economic Commission for Africa (ECA), African Center for Gender and Development (ECA, 2002; 2006).
Using the developed and validated Women’s Empowerment Matrix as a basis, an African Gender and ICT-Participation for Empowerment Index (IPE Index) will be evaluated. In addition, the empirical study will also enable the development of an ICT-Participation Progress Scoreboard. Other data analytical approaches envisioned include the use of structural equation modeling (SEM) techniques. SEM is the technique of choice because it enables researchers to simultaneous study the multiple variables in models. In addition, the technique offers the opportunity to confront a priori theory (participation leads to empowerment), with empirical data. Results from the study will provide guidelines, indicators, and recommendations for policy and decision makers in the light of the research questions posed above.

The research proposal above will be refined and tailored accordingly. Although the proposal is more quantitative oriented in nature, a more qualitative research will seek to provide answers to the following questions:
1. How do we achieve inclusive public participation through ICT with special focus on marginalized groups and communities with high illiteracy levels and low economic opportunities?
2. What are the cultural and linguistic considerations that must be integrated into ICT applications in order to enhance citizens’ participation and empowerment?
3. Are the current models of community ICT facilities appropriate and relevant to the contexts and people they are meant to serve?
4. Where are the bottlenecks in bridging the digital gap in the developing world, especially in Africa?

5.6. Conclusion

Issues concerning citizen participation and empowerment in society are well documented. They include the use of ICT to achieve good governance, where greater importance is placed on the role of civil society compared to the traditional government perspective, resulting in transparent, participatory, and decentralized governance. To some degree, the three governance characteristics – transparency, participation, and decentralization are all linked to each other. Political transparency is often measured in terms of public political participation and their free access to governmental decision-making process. Further more, autonomous local governance is another factor stimulating and encouraging the participation of citizens. Indeed, political transparency, public participation, and decentralization are crucial elements to raise people’s capacity to organize and manage their political and social life.

Various ICT solutions have been and continue to be developed for enhancing citizen participation and empowerment. Many of these initiatives are in the
form of projects seeking to provide community access to disadvantaged population groups or communities. We identified and briefly described some of these projects which we have termed “best practices” for replication in other areas. Essentially, these projects take the form of information centres and kiosks, telecentres and Internet cafés, community broadcasting centres, and others, using various technologies and approaches. Community ICT projects tend to face similar challenges, which include: poor prospects for sustainability, low technology literacy and poor technical support, unfavourable policy environment, etc. These challenges have not been substantially qualified or quantified as most information available for decision making is anecdotal in nature.

If aspirations of eliminating the digital divide are to be realistic, we recommend call for the implementation of the pre-requisites identified earlier and recommend that governments, industry leaders, and multinational organizations adopt a data-driven approach to decision making and resources allocation. We further recommend that among other things, research such as the one proposed here should be sponsored as one channel of obtaining pertinent data for data-driven approaches.

Recent advances in wireless communication are expected to provide new opportunities for community ICT projects. Given current barriers to existing ICT activities such as the lack of phone lines, there may be excitement to jump on the wireless technology as the “magical solution.” However, beyond individual use of wireless technology such as through cell phones, there is need to understand how communities, and not just individuals can benefit from the technology. Equally important is how communities can attract private sector involvement, develop more sustainable approaches, embark on relevant policy transformation, and increase their economic opportunities (thus reducing poverty) through these initiatives.

The day when we shall have a digital divide-free world may not be near. But as the proverb goes, a journey of a thousand miles begins with one step. The EP commission salutes the current efforts of all stakeholders of empowerment and participation -- individuals, groups, local, national, and international organizations, communities, and governments working at various levels to foster greater ICT-participation. This is the first step, not just as a contribution to eliminating the digital divide, but more importantly as one viable basis for the empowerment of entities identified in this chapter and elsewhere by others. We urge all stakeholders to synchronize and align their activities for the attainment of ICT-base participation for empowerment.
5.7. **References**

6. Environment

David Swayne\textsuperscript{25} Mieso Denko\textsuperscript{25}, Indur Fagoonee\textsuperscript{26}, Lindsay Marshall\textsuperscript{27}, Giovanni Molina\textsuperscript{28}, Rosham Ramessur\textsuperscript{26}, Knut Erik Solem\textsuperscript{29}, Tesfaye Woldeyes\textsuperscript{30},

ICT Issues for Environmental Monitoring and Management

6.1. Introduction

Environmental awareness has reached a virtual fever pitch across all nations. Much of this awareness comes from increased communication and shared concern in the global village. North Americans react to disasters elsewhere, partly because globalization has resulted in sizable populations in, say, Canada\textsuperscript{31}, with relatives in the location of the environmental emergency. Corporations wishing to expand to new markets now realize that they must behave responsibly, no matter what the direction of the flow of goods and capital. The recent disaster of Hurricane Katrina has demonstrated that even powerful nations have limits to their abilities to respond to environmental catastrophe.

Not all of the reaction to global environmental concerns has been positive, however. For instance, some countries, whose development is still in transition from agrarian and low energy use to urbanized and high energy use, are “pushing back” against initiatives like the Kyoto Accords. These initiatives may possibly require expensive technology, strict conservation and considerable reduction in energy use. Initial responses to initiatives to ban Chlorinated Fluorocarbons (CFCs) and leaded motor fuel also met with initial negative reaction, Those countries which still have “old growth” and “rainforest” tracts are likely to consider exploiting these resources, in the

\textsuperscript{25} University of Guelph, Canada
\textsuperscript{26} University of Mauritius, Mauritius
\textsuperscript{27} Cape Breton University, Canada
\textsuperscript{28} Servicio Nacional de Estudios Territoriales, El Salvador
\textsuperscript{29} Norwegian University of Science and Technology (NTNU), Norway
\textsuperscript{30} Environmental Protection Authority, Ethiopia
\textsuperscript{31} For example, approximately 305,000 Canadians responded to the 2001 Canadian census that they are of South or Central American origin. In response to Hurricane Mitch, which hit Central America in 1998, Canadian NGOs quickly raised CAD$15M in emergency aid.
same way as the European and North American nations removed most of their forest cover for industrialization in prior centuries.

Where there is hope for environmental protection is in the initiatives that support the aspirations of individuals and local communities. Whether to preserve water, cropland or air quality, environmental initiatives that demonstrably offer protection to individuals and livelihoods will gain support and respect. Sustainability in the environment comes with sustainable quality and security in the living space of the world’s people, one person at a time. The key is clear communication and a sound grasp on the facts surrounding the problem.

As with many other functions that support the common good, well-funded and qualified environmental agencies are necessary for basic environmental protection. Water management, the spread of disease, weather prediction, agriculture, transportation infrastructure, waste management, forest, coastline and land management all have an environmental component, even though an environmental protection agency is unlikely to be responsible for all (or most) of these diverse domains. Longer term concerns, such as reduction in biodiversity and climate change are necessary concerns of environmental agencies, even though there may not be the sense of urgency of the other issues. Environmental agencies must synthesize information from several sources, to provide and communicate all of the impacts of human activity in a comprehensive and scientific manner. Resident expertise is a prerequisite to a sustainable environmental protection function: domain knowledge, predictive capability, monitoring, record-keeping, maintenance of environmental media quality standards, education, and (at the centre) knowledge synthesis about the environment.

The Declaration of Principles stated by the World Summit on the Information Society (WSIS 2003) indicated the necessity to "share information and knowledge". It thereby placed emphasis on the particular importance of ICT within the context of knowledge for development. Experience has demonstrated that the introduction of ICT-supported education in environment is either likely to fail, or that the benefits will be limited if the introduction of the new technologies is not combined with the development of important skills to operate and maintain the new technologies. It is also necessary to develop the appropriate organisational infrastructure in which the newly acquired skills become embedded.

At WITFOR 2007 we examined the roles of ICT and environmental protection from several perspectives: the dimension of environmental problems, examples of initiatives taken in environmental agencies, proposed
environmental projects, the need to involvement of the public, and the role of ICT in each of these areas.

6.2. Problems and Problem Scales

Two ecoregions of the world, Africa and Central America that have common shared environmental problems were included in WITFOR 2007 program for the Environmental commission. The spatial scales are immensely different, but environmental issues that affect the well-being of the common person are shared: weather and climate change, alteration of land cover, resource extraction and geological activity.

African countries are affected by hydro-meteorological hazards and disasters, floods, mass movements (e.g. erosion, landslides and siltation), heat waves, wildfires, tropical cyclones, hurricanes and tornados, hailstorms and dust storms (Anon. 2007). Much of this environmental stress is shared by Central America. Devastating catastrophes experienced in both regions (Figures 1-3), also result from other natural and/or human-induced events which may be geological (e.g., earthquakes, volcanoes, tsunamis and collapse of construction projects), biological (e.g., diseases, pest infestation and biological weapons), or technological (e.g., global warming, air and water pollution).

Figure 1. African Continent (Source http://weather.yahoo.com/forecast)
Central America is resource rich, but concerns remain about the sustainability of the resource economies. As demand (and hence price) fluctuates, real constraints are placed on the exploitation of resources in a wealth-producing, but environmentally sustainable, way. Earthquakes, volcanic activity, torrential rainfall, unstable topography, land use issues, and sustainable development are shared environmental problems. Central America is a sometimes victim of violent hurricanes, and the safety and security of water is an ongoing concern of government.

Figure 2, Central America and the Caribbean. Large storm events result in periodic severe environmental damage.  
http://weather.yahoo.com/forecast
Figure 3, a shared risk: the positioning of Central America at the interface between several of the tectonic plates, and the location of seismic activity in Africa pose a large-scale risk to both regions (Source: Digital Tectonic Activity Map of the Earth (DTAM) NASA, USA).

Local scale problems occur in both regions. The Central American environment does not have the incredible diversity of agriculture and agricultural practices, but it does share many of the problems. Landforms are often unstable without natural cover. Hence, removal of forest may result in extreme cases of soil loss and water contamination in either region, where the conditions are similar. The arid regions of Africa are delicate ecosystems which cannot support the intensification of food production that may be necessary for human well-being. Sedimentation and other forms of pollution threaten fisheries and tourism. Loss of agricultural land accelerates the movement to cities, themselves a growing environmental concern as now almost 50% of the World’s population is urbanized32.

Key links between large-scale and local scale problems are biodiversity, food and water security and climate change. Global change is not just climate change but also encompasses biodiversity loss, land use and cover change, atmospheric composition change, and demographic change such as urbanisation. This requires a global response, and not just the protection of a few places or a small number of threatened species. This priority area cuts across all of the other three areas and manifests a complex relationship between human activity and survival on the one hand, and the Earth system

32 According to an article which appeared in the New York Times (USA), June 27, 2007 “half the world’s population will soon be urbanized”.
and its processes on the other hand. The areas of interest include eco-systems and biodiversity, desertification, water and air pollution, global warming and sea-level changes. Hence, our quest for a sound understanding of Global Change compels us to work on the complex interactions between the Earth’s core-mesosphere-asthenosphere-lithosphere-biosphere-atmosphere.

Despite the regular occurrence of hazardous events there is often little understanding of their actual economic impact, especially when several devastating events occur together. Integrated modelling would enable precise evaluation of the vulnerability to hazards and disasters (e.g. droughts, tsunamis, swells, floods and cyclones). The ultimate objective would be to minimise the cost of damage, and make accurate assessments of losses. The other objectives would include the minimisation of vulnerability associated with urbanisation; and prediction of the effect of climate change on the frequency and severity of hazards and disasters.

6.3. **Key Linkages in the Information Chain**

Data sources worldwide must be identified, their quality assessed and catalogued. Resources such as the US National Oceanic and Atmospheric Administration (NOAA), the National Center for Atmospheric Research (NCAR) and their counterparts around the world are excellent generators of models and data on a grand scale. Unfortunately, knowledge of the availability of data about a particular environmental topic comes usually from working in the field, and, like many other commodities in the world, its presence is not universally known.

Geographic Information System (GIS) software can be used for Environmental Sensitivity Index (ESI) map compilation and production. ESI maps are finding ever widening use in such areas as agricultural land use, coastal resource inventories and assessments, coastal planning, and recreational planning. For instance, sensitive wetlands are a high priority for protection, but when oiled, cleanup should be restricted to prevent additional damage from human activities. ESI shoreline classifications now provide information necessary to aid in these decisions.

Urbanisation, industrialisation, desertification and warming add to the ‘natural’ burden of tropospheric ozone and particles. Hence, capacities for the observation of air pollution should be enhanced using air pollution and ultraviolet sensors. Both human and crop damage issues should receive attention and suggested improvements include an updated and reliable emission inventory of anthropogenic aerosols and gases within Africa; addition of data from AFRIFLUX (Hannan, 2004, African network of air-surface fluxes); study of the long and short range transport of aerosol impact
on Africa; and, the direct and indirect effects of aerosol on rainfalls and dust concentrations. The impact of bushfire clearing on climate change was suggested as another important issue. Involvement on both planning and management levels within the international programmes should improve the balance of leadership between African countries and international partners.

Future activities in environmental ICT include: (a) observations - the links between biodiversity → ecosystem function → human well-being, (b) causes and indicators of biodiversity loss and, (c) strategies for sustainable use are all targets of initiatives. There is a need to understand vulnerable systems and identify the impacts on wetlands, riverine systems and coastal regions. An effective policy on land degradation would aim at reducing vulnerability in the long term, and it is therefore essential to communicate science to stakeholders and policy makers. Hence, there is a need to build an effective and user friendly database for regions, such as Africa, as data are currently scattered.

6.4. 21st Century Infrastructure

High technology data gathering requires massive public expenditure. Remote sensing technologies represent sensors held aloft in clouds of money, and the information gained is usually shared (as it should be). Remote sensing also requires ground truthing, and it is necessary to deploy world-wide, more extensive data gathering devices as new technologies permit. Since this is an ICT conference, we elaborate on this theme in this section.

Much of the world’s population lives with no or limited access to modern communication infrastructure. Due to a lack of appropriate communication infrastructure data collection from remote rural geographical areas and making timely decisions is a major challenge. The percentage of population with access to the basic telecommunication and the Internet services is significantly low. Difficult terrain coupled with high installation, maintenance and service costs have limited the penetration rate of wired ICT to rural areas. To confront these challenges, new and cost-efficient software and hardware solutions for communication networks and communication architectures are required for these environments. Wireless communication networks are alternative technologies to the wired counterparts and have great potential for providing communication services without setting up wired networks. They have been widely adopted in many developing countries in recent years. Studies have indicated that mobile cellular technology has higher penetration rate in developing countries in comparison with the developed nations (ITC, 2003). Similar trend may occur with other emerging infrastructure-based and infrastructureless wireless networks. These emerging wireless technologies include IEEE 802.11 Wireless LANs,
Bluetooth, Radio Frequency Identification (RFID), WiMAX, Wireless Mesh Networks (WMNs), Mobile Ad Hoc Networks (MANETs) and Wireless Sensor Networks (WSNs). The seamless integration of heterogeneous wireless and wired communication networks can facilitate access to ICT and, foster environmental monitoring activities and bring about sustainable economic development.

Mobile ICT infrastructure for environmental monitoring and management can be built on a hybrid wired and wireless communication networks. We envision a multi-layer and multi-functional communication architecture that consists of four main layers. The fourth (bottom) layer consists of tracking or sensing devices that are often mounted on the phenomenon under study. We call these devices trackers. The third layer consists of mobile devices (Personal digital assistants, cell phones, smart phones, laptops, etc) and held by mobile users or mounted on moving devices that interact with trackers to collect data. We call these devices clients. These devices have the capability to communicate with trackers. The second layer consists of wireless communication medium and could be based on WiMAX, MANET, WMN, WSN WIFI communication networks. It provides wireless communication capability between the third layer and the first layer entities. The first layer (top) consists of data or web servers that act as data repository. The servers are connected to the wired communication infrastructure and allow communication among heterogeneous networks including the global Internet.

Real devices used in an instrumentation and control laboratory can be manipulated on the Internet (Saliah- Hassane et al., 1997). A programmable logic controller (PLC) can communicate directly with the sensors to receive signals and to activate the actuators. Key benefits are the elimination of cables and connectors from the manufacturing floors, resulting in shorter installation times and reduced machine maintenance, and the potential for a flexible topology and mobile applications. Furthermore, the wireless technologies facilitate communications with rotating and moving machine parts and enable systems to be programmed, actuated and automatically report their status back to a central controller or to an operator with a laptop or another wireless device. Some biosensors use screen printed carbon based inks on PVC substrates, so are fundamentally very low cost and disposable. Another sensor, with the electrode suitably impregnated and coated, can be used to detect water polluting ions down to parts per billion.

The communication architecture described above consists of four functional units: the tracking and sensing unit, data aggregation unit, data transmission unit and data management unit. The tracking and sensing unit is responsible for sensing, monitoring and tracking information from the phenomenon. The
technologies used for this purpose include sensing devices (Akyildiz et al. 2006). The data aggregation unit is responsible for data gathering and aggregation before transmission to the repository or web server. These devices are either mounted on vehicles, stationary units or held by users. The data transmission unit is responsible for transmitting data over wireless communication media towards web servers. The web servers themselves can be mobile or stationary but have reliable connection to the wired communication infrastructure. A number of tools are available to support data publishing (uploading) or downloading. Two possible tools are: (a) Mobile file transfer which is optimized for wireless transmission using mobile devices. (b) HTML forms which allow data input/output using http get/put commands from mobile devices screen. Finally, the data management unit is responsible for data processing using mathematical or statistical methods. After processing and analysis, the information can be shared, disseminated for quick and better decision making on the environmental phenomena being monitored.

The proposed schemes can be used to monitor and collect different kinds of environmental data. Each environment could be monitored using different wireless networks (possibly heterogeneous). The information can be gathered using different mobile devices depending on environmental condition under study. However, all systems require wireless communication network, clients and web servers that store and process the required information. The most common application scenarios of such architecture include soil type and quality management, field crop conditions, water quality management, precision agriculture, habitat monitoring, forest fire detection and control, earthquake detection and control, flood and tornado management. The main challenge is how to reduce the communication and processing delay between data gathering phase and the release of the processed information for timely decision making. There is a need to provide different network design alternatives and implementations depending on the application scenario being considered in the study.

Challenges in wireless networks and mobile computing applications emanate from two main sources: wireless communication links and mobility. Wirelessness introduces limited bandwidth, limited storage space, low processing power and security challenges as communication is carried out over wireless media. Efficient file compression algorithms and data coding schemes are required to transmit large data size such as video and images. Moreover, wireless communication supports limited communication range and the use of MANET (Charles, 2002) provides multihop communication but introduces additional challenges. Mobility on the other hand supports portability and flexibility but introduces challenges related to addressing and
location management. Also, mobile devices have small screens and limited input capability. The location tracking and data management techniques designed in mobile environment should be efficient and incur low processing overhead. Existing technologies can be modified to support mobile devices by taking into account their salient characteristics and challenges they face. Data entry, storage and exchange can be facilitated by using existing and emerging web technologies. Wiki and Web Services are two possible applications that benefit practitioners and researchers in environmental monitoring, control and management. There is a need to develop Mobile Wiki and Mobile Web Services for creating forums and databases for information exchange using mobile devices. Wiki allows multiple users to add or delete contents to exchange up-to-date information. Web services are based on XML technology and use different techniques including the Simple Object Access Protocol (SOAP) for communication, registration and information exchange. The exchanged information can be data or multimedia information (data, video and sound). There is also a need to investigate the development and deployment of mobile geographical information system based web services to enhance accessibility, flexibility, coverage improved information exchange.

6.5. **Humans: the Key Link**

Like much of the world, Africa is composed of long-standing and vibrant small communities which are usually self-sufficient, but which are under a lot of environmental and economic pressure, and almost every possible scenario has an example to be found.

Several of the contributors to the Environment Commission have been examining the role of public consultation in the Yukon Territory of Canada (K.-E.S.), among First Nations in Canada (LM), Australia (DS). There is a need to develop a two-way stakeholder approach to environment issues. Water management, particularly in a situation of endemic water shortage, is an extreme example where the historical climax to water use negotiations has been armed conflict, and where a better solution has to be found. Not lost in this consideration is the need to protect minority stakeholders from the tyranny of the majority. When, for example, rural landholders have their land intentionally flooded to protect city dwellers, the process is as important as the result. ICT can play a key role in mitigating the sorts of problems that are the usual outcome of dilemmas like this. Decisions originating and taken on a local level with democratic openness and necessary understanding of the role of useful technological tools could probably demonstrate exactly that.
6.6. *Education, the Key Component*

Environmental education has to be considered a priority role for ICT.

It has been noted that even when science predicts the occurrence of a devastating event, this is not usually followed by application of appropriate measures to minimise the damage on societies due to limited interface between science and policy. eLearning Africa has provided the venue for the creation of a new network of decision makers, helping to link representatives from government and public administration with universities, schools, governmental and private training providers, industry, and important partners in development cooperation. Flexible computer platforms enable learners to conduct experiments with other team members, over computer networks, and to participate in interactive simulations, all in a context of distance learning. In one research project on electronic measurement and telemanipulation over computer networks, a procedure showing that ICT, within a relatively short time frame, can be used to create virtual laboratories with collaboration and data sharing for conducting experimental simulations with digital models and accessing the facilities of a technical or teaching assistance resource centre (Saliah-Hassane *et al.*, 1997; Saliah-Hassane *et al.*, 2001). Online experimentation allows students from anywhere to operate remote instruments at any time. Web service, as the latest technology for distributed applications, provides a new potential to build Online Experiment Systems (OES). The most valuable feature of Web service for OES is interoperability across platforms and programming languages. A service-oriented architecture for OES enabled by Web service protocols was proposed and a methodology to wrap the operations of instruments into Web services was presented as the classic Web service is stateless. Web services have been found to have intrinsic weaknesses on latency because of using more transport layers for communication and there is a need to justify if the performance of Web services is feasible for online experiments. Most adult learners already make use of the Internet as it increases flexibility in regard to when, where, and how to learn whereas mobile-learning will now be able to support new trends in workplace learning and in fieldwork – particularly informal learning - by supporting the delivery of short pieces of content on demand and at the point of need. In order to monitor the very impact of eLearning/ Blended Learning activities in environment, a set of criteria has to be developed and implemented whereas electronic conferences can be designed to facilitate discussion among small-scale food producers - women and men who produce and harvest field and tree crops as well as livestock, fish and other aquatic organisms (including communities, small farmers, fishermen and landless people).
Video-Conference is still highly inaccessible because of the cost of telecommunications involved in the process, while with the limited Internet bandwidth available in mainly developing countries and with reference to Mauritius, videoconferencing is still not a widely used feature. The implied costs of 3G services are still too high for the wide adoption of this technology among the community. The emergent technologies seem to make it imperative to integrate every new technology in the teaching and learning process (Ramessur and Santally, 2007). The availability of advanced mobile technologies, such as high bandwidth infrastructure, wireless technologies (WiFi, Bluetooth) and small handheld mobile devices (iPods, PDAs), has however started to extend e-learning towards m-learning (Sharples, 2000). Effective transfer of information and data from environmental scientists to policy makers should be improved and informed decisions based on scientific evidence facilitated using ICT tools. Meaningful inter-disciplinary collaborations including the involvement of social scientists should also be promoted.

6.7. Conclusion
Information and Communications Technologies can function as the messenger, the medium, and the arbiter. We (collectively) have the technical know-how to make ICT do all of those things. It is our prime responsibility to make the case for them.

Collaborators from the North in joint North-South projects are usually impressed by the level of commitment and the quality of commitment to the environment that colleagues from the South possess. In joint projects, the engineering and scientific knowledge brought to the table by all colleagues is outstanding. When such projects are undertaken, much more than technology is transferred, and the direction of transfer is a two-way flow. Projects are often “bootstraps” that convert project opportunities into permanent infrastructure, on both sides. This is as it should be.

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7. Health

Arthur Heywood\textsuperscript{33}, Jørn Braa\textsuperscript{34}, Sundeep Sahay\textsuperscript{35}, Calle Hedberg\textsuperscript{36}

Status of National Health Information Systems in Selected Developing Countries

What do countries understand by integration?

7.1. Introduction

This chapter describes a comparative study of Health Information Systems (HIS) in a number of developing countries using an assessment tool developed by the BEANISH / HISP network\textsuperscript{37} for the Health Metrics Network (funded by DFID) in 2005 for diagnosing and planning Health Information Systems (HIS).

The tool (see annex) quantified the achievements of each country according to a normative framework and gave each country a score according to 11 categories, based on HIS-related problems found to be endemic at all levels of the health administration: Fragmentation: with a lack of coordination and integration among numerous sub-systems where each health program runs their own system with little regard as to how this is integrated with the overall HIS. There are excessive data and reporting demands on health workers, with multiple uncoordinated forms overlapping each other and leaving gaps. A lack of standardisation and alignment within and between data sets and reporting forms contributes to poor quality of data and the information that can be derived from it. Management hardly uses existing information for planning and monitoring and staff responsible for the HIS is inadequately trained and under-skilled at all levels. There is insufficient financial and political commitment to the HIS at the national level.

The approach was to use both a rapid assessment tool, carried out by BEANISH partners, and direct observation. Active participation in the HIS

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\textsuperscript{36} BEANISH; Building Europe-Africa Networks for applying ICT in Health, a project under the EU 6\textsuperscript{th} Framework Program. HISP: Health Information Systems Programme. www.hisp.info
development process in a number of countries enabled the authors to have a deeper understanding of the issues and many of the results rely upon our interpretation based on detailed first-hand knowledge of the country situation.

Of the nine countries (and three states in India) assessed, two – Thailand and South Africa stand out as champions of information use. They used very different models to achieve the desired results of a flexible yet standardised information framework and adequate human and infrastructural resources to use information and were driven by different motivations – a health insurance scheme in the case of Thailand and equitable health care in the case of South Africa.

Integration of HIS was the dominant issue in all countries surveyed and was differently understood in different countries. The most important level of integration appears to be the organisational or user level, getting the leadership of different programs to agree on the basics and to support the overall HIS, rather than their own program-focused, vertical “information silos”. The data level of agreed indicator sets and the technical level of gateways between different HIS flow relatively easily if there is agreement amongst leadership. It seems that the Millennium Development Goals have enormous potential to provide the central core around which integration can occur.

7.2. Assessment approach
Broadly, the tool looked at the following components of the HIS:
1. Performance of the various sub-systems and overall HIS, and the level of functional integration.
2. Performance of HIS with respect to data quality, collection, processing, analysis and the use of information.
3. Identify on-going development processes and major problems/shortcomings as well as identifying options for addressing such issues.
4. Provide clear criteria by which country information systems can be evaluated.

The tool was developed and tested in collaboration with representatives from the health services and other stakeholders from the following countries: South Africa, Botswana, Malawi, Mozambique, Tanzania, Ethiopia, India, Vietnam and Thailand.

The assessment was carried out against a set of “best practices”, quality or success criteria. Stakeholders in all countries identified fragmentation and poor coordination of sub-systems as the key problem. This problem was
seen to be currently increasing due to donor pressures, in particular in the HIV/AIDS domain.

The tool quantified the achievements of each country according to the following framework.

Table 1 Normative Framework

<table>
<thead>
<tr>
<th>Context and resources</th>
<th>Legal and regulatory framework: Policy and priority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resources: Human, financial and equipment</td>
</tr>
<tr>
<td></td>
<td>Data flow and information infrastructure</td>
</tr>
<tr>
<td></td>
<td>Management: National and local HIS committees</td>
</tr>
<tr>
<td>Process</td>
<td>Integration: Institutional, data and technical</td>
</tr>
<tr>
<td></td>
<td>National indicators and data sets</td>
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<tr>
<td></td>
<td>Software at the District</td>
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<tr>
<td>Outputs</td>
<td>Quality of data and information</td>
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<tr>
<td></td>
<td>Use of information: mechanisms promoting information use</td>
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<td></td>
<td>Information culture</td>
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<tr>
<td></td>
<td>Information for action</td>
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<tr>
<td></td>
<td>Dissemination and advocacy</td>
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</tbody>
</table>

7.3. **Scoring by country**

The tool was used to score individual countries, and, in the case of India, different states as well. This process was fraught with difficulty as countries were assessed at different stages of development of the tool and consequently with different wording of questions, numbers of questions and degrees of consolidation.

An interesting overall picture emerges as shown in the following table:
<table>
<thead>
<tr>
<th>Countries</th>
<th>Legal Framework</th>
<th>Human Resources</th>
<th>Finance</th>
<th>HIS Infrastructure</th>
<th>Data Mgt.</th>
<th>Plans Indicators</th>
<th>Data source</th>
<th>Analysis &amp; use info.</th>
<th>Dissemination</th>
<th>Info. for action</th>
<th>Advocacy</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>67%</td>
<td>43%</td>
<td>50%</td>
<td>58%</td>
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<td>61%</td>
<td>60%</td>
<td>55%</td>
<td>27%</td>
<td>75%</td>
<td>39%</td>
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<tr>
<td>Ethiopia</td>
<td>33%</td>
<td>19%</td>
<td>33%</td>
<td>8%</td>
<td>22%</td>
<td>17%</td>
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<tr>
<td>Malawi</td>
<td>75%</td>
<td>57%</td>
<td>42%</td>
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<td>33%</td>
<td>61%</td>
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<tr>
<td>Tanzania, mainland</td>
<td>58%</td>
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<td>Botswana</td>
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<td>Mozambique</td>
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<td>Karnataka, India</td>
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<td>33%</td>
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<td>7%</td>
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<td>17%</td>
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<tr>
<td>Andhra Pradesh, India</td>
<td>42%</td>
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<tr>
<td>Kerala, India</td>
<td>25%</td>
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<td>50%</td>
<td>37%</td>
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<td>28%</td>
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<tr>
<td>Vietnam</td>
<td>58%</td>
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<td>67%</td>
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<tr>
<td>Thailand</td>
<td>100%</td>
<td>81%</td>
<td>83%</td>
<td>87%</td>
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<td>83%</td>
<td>100%</td>
<td>89%</td>
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<td>100%</td>
<td>94%</td>
<td>85%</td>
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</tbody>
</table>
The “quick and dirty” analysis goes as follows:
1. The grading is consistent with Gross National Income per capita applied logarithmically”;
2. This needs to be adjusted with the Human Development Index as poor distribution of resources in a country has a significant impact on the total score, and at the same time is a major issue in the HDI.

With more data, fine-tuning of the tool and some correlation exercises, it should be possible to arrive at a rough but useful “expected or ideal HIS performance” derived from the country’s combined HDI/GNI rating. Countries may thus be graded according to their HIS achievements as correlated with their level of development, measuring improvements in data usage and not according to absolute standards.

A comparison between South Africa and Thailand on one hand, and a comparison between these two countries and the rest of the sample countries on the other hand, reveals that data use for resource allocation is the most powerful way to institutionalise information usage. By linking this to an service coverage scheme, as in the case of Thailand, integration of different data sources is (relatively) easily achieved.

South Africa ends up with an average score of roughly 55% whereas Thailand ends up with roughly 85%. South Africa is thus scoring considerably lower - mainly due to:
(a) Thai data being available to all via the web (Note; this requires both infrastructure and political will to make information public)
(b) Thai data/indicators being used for resource allocation for several years.
(c) South Africa scores low on dissemination and use of data for advocacy.

Since South Africa is just starting to use data for resource allocation, it's likely that they will move up relatively fast, because the basic data collection systems etc are well established.

7.4. **Cross-Country Assessment**
In this section, we present an assessment of how the different countries fared on the various questionnaire categories in the HMIN tool. This qualitative analysis builds on the quantitative assessment, and contributes to enriching it.

7.4.1. **Legal and Regulatory framework**
With the notable exception of Thailand, it can be seen that no country has an effective and working legal and regulatory framework supporting the HIS.
Where such a framework does exist, it appears to be more in form than content, and what exists is usually weakly implemented in practice.

In Thailand, the HIS reform process is tightly linked to the national reform process and the wider political agenda, thus providing it with legitimacy and the buy in of senior political and administrative leaders. There are various legal acts in place including one on universal coverage scheme which provides the basis for the health insurance. The linkage of the HIS with the insurance scheme ensures that there is a demand for good quality and timely data, which provides the necessary incentive to strengthen the HIS. Another feature of the regulatory framework is that it is flexible, allowing the HIS to respond to new demands, such as the initiation of a “Healthy Thailand” Program. The HIS design is flexible, with various provinces being allowed to experiment with different approaches and platforms, but within a national template articulated through national policy providing a common framework for the HIS.

7.4.2. **Human resources**

Lack of adequate numbers of Health Information systems staff with sufficient computer skills and understanding HIS issues emerges as a universal problem. This problem is especially pronounced at the district and sub-district levels. Again, an exception to this situation seems to be in Thailand where despite the shortage of full time dedicated staff at the province and national levels, at the sub-district level there is a cadre of dedicated and computer-literate staff. In Thailand, the main drivers of the HIS are the health staff reporting for their universal coverage scheme. The data entry and the report generation are done primarily by the data collectors themselves which ensures better quality data. Also noticeable is the absence of foreign or IT consultants, (as seen in Mozambique), and the software development has been done primarily by local “doctors turned hackers”. This process, while allowing for reduced dependency on foreign consultants, brings a degree of randomness and unprofessional practices into the software development process, which follows primarily a “learn as you do” strategy.

In contrast, computerization in the states of India is being driven by statistics staff who are relatively uninformed about HIS issues. In Karnataka, for example, computerization is by program, and often driven by the program directors at national and state levels. Training is planned separately by each program so different people get trained by different programs. There is a need to integrate this so that a core group of trained people are developed within the health department at each level.
Training in general, when available, is focused on computers and IT literacy, rather than on equally useful concepts related to information systems and practices relating to the use of information for action. Exceptions to this are:

- In South Africa, one university (UWC) developed a series of different courses for different levels of health Information Officers and health managers and has trained thousands of staff at “winter and summer schools”. A number of other universities are now following this example and running HIS-related courses.
- In Thailand, the MoPH epidemiology unit and universities run a variety of courses for doctors, paramedics and health technicians, and general health workers.

In general, there is an absence of a career structure for health information officers, though South Africa is developing a career structure for HIOs with possibilities for promotion. Kerala plans to create a dedicated cadre of health staff, but implementing this is a challenging task. In Andhra Pradesh and Karnataka, the introduction of the new HIS was carried out largely by contract data entry operators who worked in isolation. When they left, there was no capacity amongst the health staff to carry on the tasks.

7.4.3. Finances

In general, it is difficult to get in-depth and accurate data on the financial aspects of the HIS, such as budgets and investments. This in itself is an indication of the lack of formal support provided by the health departments to the HIS activities. The level of financial investment was gauged through the presence of computers, telephone, internet connections etc.

In some countries, the level of computerization was quite widespread, for example:

- Thailand where even the remote Primary Health Care facilities had functioning computers, telephone lines and internet connections paid for by the universal coverage scheme.
- Andhra Pradesh, India, the government spent large sums for the purchase of computers and expensive software licenses to equip PHC clinics and to develop a name-based software. This investment has been ineffective in developing effective HIS and this money could have been more usefully invested into more fundamental issues such as working conditions and basic training of health staff.
7.4.4. Health Information Infrastructure

The HIS infrastructure comprising of computers, software, printers, telephone lines, internet connections etc, was variable both within and across countries.

• In Thailand there appears to be a uniform spread of high quality and working infrastructure.
• In Andhra Pradesh, India, there are computers available in every clinic, but currently underutilized.
• In Kerala and Karnataka, there are almost no computers available at the sub-district levels. The computers, when present, are largely used by the statistics and demography departments, and not for HIS-related activities.
• Vietnam is very poor on computer infrastructure, though appearing to catch up rapidly.

Basic infrastructure for the computer based infrastructure to work, such as electricity and roads were poor in many countries. Technical support is another important infrastructural concern, especially for facilities in remote areas. Huge amounts of down time were reported because of computers and printers in need of repairs. In the absence of binding maintenance contracts, vendors are reluctant to travel to remote areas for support.

Appropriateness of infrastructure for the local conditions was another concern.

• In Andhra Pradesh and Karnataka laser jet printers could not be used because of lack of budget to purchase the expensive toners. Yet the Andhra Pradesh government bought expensive Oracle license at each clinic. The investment in such software remains highly questionable.
• A refreshing contrast can be seen in Vietnam and Kerala, where the government has made a conscious decision to go for free and open source software.
• In Thailand, investments in Oracle software at national level seem appropriate as there is a need for large data storage capacity and apparent capability exists amongst the staff there to operate it.

Inappropriate and dysfunctional software is reported from many countries.

• In Karnataka a hospital management system was implemented and used for some time but fell into disuse because after the developer left there was no capacity to further revise the system as requirements changed.
• In Mozambique, since the foreign developer left in 1995 the number of bugs has accumulated, as has the mismatch between changing needs and the functionality of the system that was “cast in stone” and locked from
the time the system was implemented. Due to lack of capacity and problems with the documentation, it has not been possible to update the system.

7.4.5. **Institutional mechanisms for promoting information use**

Institutional mechanisms for promoting information usage and integration are generally weak in most developing countries. In South Africa and Thailand, however, mechanisms for such promotion have been created through:

- Agreed Indicator and Data Sets at different administrative levels (national, provincial and state/district) with standardised definitions and a clear data flow policy.
- Legislation and Service Level Agreements between tiers of government, with emphasis on performance monitoring and ensured data quality
- Activity-based budgeting using routine data backed up by surveys.
- Performance contracts for higher-level managers.
- District competitions and awards for best performance and most improved performance in different categories.

Thailand has made a conscious attempt made to link health resources with health services and health outcomes. For example:

- The key to improved information use is the direct linkage between payment of contractors and the routine reporting of services delivered. Regular surveys are used to triangulate accuracy of routine information
- Diagnostic and procedural coding using ICD9 creates uniformity between different ministries.
- The National Statistics Office (NSO) is proactive in trying to reduce the gaps between survey data and routine data. NSO is also playing an important coordination role, producing basic statistics; coordinating surveys carried out by different ministries and dissemination of information.
- The internet is used in proactive ways to promote coordination. Data on the net makes it accessible to the different stakeholders, and imparts efficiency into the process, with the net being used for the transmission of data across different levels.

South Africa is linking resource allocations and budgets directly to health services and outcomes using information from routine systems and some surveys:
The Grant to Tertiary Hospitals has for the last 2-3 years been dependent on activity data.

All provinces are shifting to activity-based budgeting, with radical impact on individual districts and/or hospitals.

Integrated Development Plans are a legal requirement for all municipalities, and they will increasingly be linked directly to conditional grants and performance-based Service Level Agreements.

Long term Provincial Strategic Plans and a new “Early Warning System” are largely integrated with and heavily dependent on routine information systems.

The new National Indicator and data set covers all levels of service delivery, as well as many other areas.

There is a strong push towards diagnostic and procedural coding based on ICD10 in both the public and private health sectors.

NGOs, universities and other partner organisations to the SA Department of Health are playing important roles with respect to information dissemination and use.

While there has been reluctance to make health data available to the general public via the web, there is a significant drive towards making information available via the government intranet to all managers.

Many of the challenges relating to institutional mechanisms are inherent in the organisational structure of the public health system, which is comprised of various vertical programs, often supported by different donor agencies. Such structures promote independent and compartmentalised use of information with little incentive for sharing, even when it is required for improving health care delivery. For example:

- In Andhra Pradesh, most Indian states and Mozambique, the AIDS Control programs operate independently, divorced from the rest of the public health structure. While they need data collected by the PHC system, there are no mechanisms for sharing this data.
- Mozambique has a similar disconnect within programs such as Malaria, where the four different reporting channels do not speak to each other, restricting the development of an overall picture of the malaria status in the country, and stopping effective sharing of scarce resources.

In the private health sector the institutional mechanisms for promoting information usage are inhibited for different reasons: increased commercialisation and stock market orientation of the companies running private health services. For instance, health care companies in South Africa have largely stopped providing routine data to the government, because activity data is viewed as strategic information in a market dominated by
CEOs more interested in stock prices and bonuses than improving public health status.

Faith-based health programs face the same challenges and structural deficiencies as the public sector, with fragmentation, multiplicity of vertical programs, etc. These organisations are generally less bureaucratic and more open towards collaboration. For instance, mission hospitals have been enthusiastic partners in recent HMIS development activities in Nigeria and in Tanzania are actively searching for affordable Electronic Patient Record systems.

7.4.6. Analysis of data and management use of information

It is important to understand that all organisations, public and private, in developed and developing countries, collect more data than they actually use for decision-making and action. Some data is used for organisational power games, some data collection is simply done due to bureaucratic inertia. A review done in South Africa in 2002 showed that more than 50% of the data submitted were neither looked at nor captured but dumped. The subsequent rationalisation radically reduced this waste of time and resources.

The countries assessed all suffer from a significant amount of data collected but not analysed or used. There are encouraging aspects, in particular for South Africa and Thailand:

- In South Africa individual provinces, districts and national programs are systematically using information for action, with proven successful outcomes. The health sector is in a major shift towards activity-based budgeting where information will be a deciding factor on resource allocation.
- In Thailand, there is a maturity around the use of information that can be gauged from the fact that the information is being used to support the everyday working of the health department as well as national initiatives of “healthy Thailand,” and the national insurance scheme.

Both countries, despite significant and increasing use of information for action, still collect more data than they use, and health staff face major challenges in increasing analysis and use – particularly at the district and local levels.

In India and Vietnam, the relation between data collection and information use for action is severely mismatched.
In Andhra Pradesh, and Karnataka, the PHC structure collects more than 1,000 data items, including many duplicates and data from programs that have been discontinued. Indicators are hardly used, and targets are based on population figures rather than on programs for action. The targets, mostly unrealistic and unreachable, are a constant source of manipulation as the health staff falsify the figures to show that they have achieved the targets because The punishment for not reaching targets is worse than the punishment for being caught lying.

In India, we often found the numbers to be “perfect,” showing achievement of targets, which indicates the possible manipulation of numbers. Also, targets are set without taking into consideration differential conditions such as access and resources or current indicator values.

Vietnam too has a centrally planned health service, and data is commonly manipulated to artificially achieve impossible targets, without any cross-checking from supervisors or top management.

One prevailing and important problem in most countries is the vicious cycle that poor quality data is not used, and because it is not used, it remains of poor quality. The poor quality is perpetuated by weak mechanisms for supervision as well as the multiple and outdated population figures that are used. Many clinics deal with three sets of population figures; that of the health department, the revenue department, and figures compiled by household surveys conducted by an independent agency.

The “holy grail” of promoting analysis and use of information is clearly to link information to resource allocation (budgets) as well as developing indicator-driven short- and medium-term planning.

Linking HIS indicators to targets is in itself no guarantee for the collection of quality data or for their use in decision-making. Fulfilling targets can become a meaningless propaganda exercise where everybody is making up data, but nobody wants to “rock the boat”. Concrete planning and targets are crucial, but plans and targets must be realistic and linked to resource allocation. Evaluation of the achievement of targets should focus on the entire process of the HIS and not just the outputs. Evaluation should stimulate constructive suggestions on how to improve the process rather than on reprimand and public shame.

One more emerging trend should be noted: the growing use of local, low-cost surveys to augment routine information. Traditionally, most surveys are either research oriented or aimed at serving the needs of the national ministries or donors. Such surveys are not only “alien” and perceived as
irrelevant at the local level, they are often used in a judgmental manner and inherently based on the assumption that health workers and managers cannot be trusted and must be tightly monitored by outsiders. Low-cost and locally done client satisfaction surveys, facility surveys and audits, and community surveys are therefore not only valuable in themselves for local monitoring, but they also indirectly provide the local level with better information for use in interaction with traditionally dominant donors and central governments.

7.4.7. Dissemination of information

The various case studies show a variety of stakeholders involved in the dissemination of indicators and information. The case studies were too brief to reliably quantify what share of information is regularly disseminated, but some positive examples were noted:

- Thailand reflects a strong culture of information dissemination in the form of books, periodicals and journals. The Thailand Health Profile is a particularly impressive consolidation of a wealth of information from numerous data sources within and outside the Ministry of Health. Web-based dissemination is also very strong in Thailand.
- In South Africa, the annual Health Systems Review is another example of creative use of information about the health system, published by a NGO with contributions from the whole health sector. Web-based dissemination is slowly increasing, from the Dept of Health, NGOs and universities. Data from the latest Census, albeit with quality problems, are available from an interactive database-driven web site.
- Botswana has produced good data-based information for HIV/AIDS advocacy.

The most common products disseminated still are bulky “statistical” annual reports, usually published 1-3 years after the relevant period. These reports are dominated by raw data and not indicators, are hardly ever linked to targets, goals or health policies, and usually end up being used for “reference” purposes. The presentation of this data is not very effective and the application of maps and useful graphs is minimal.

Several countries studied have very progressive legislation regulating and promoting access to information – at least information held by government. Examples of bureaucratic sabotage or bungling in relation to such rights are common – as they are in developed countries– but our overall assessment is that accessibility is slowly improving.
The most common factors inhibiting dissemination of factual data and information are:

- (Information) managers focus on providing data and information to their superiors not feedback to their subordinates or the general public.
- Fear that poor indicators or results will result in criticism, or that it will provide avenues for e.g. attacks on the government and/or specific managers. *Questions about “what do you want this data for?” are quite common.*
- Gaps and errors in the data are commonly used as an excuse for not disseminating information, usually exacerbating the problem because health workers collecting the data get further discouraged by seeing that their data are not used to support their everyday work.
- Political expediency and the perceived need to control access to data and information as one element in the overall control of society and the public agenda.

### 7.4.8. Advocacy

Using health data and information for public advocacy purposes is common, in particular related to high-profile health programs like HIV. Such advocacy is predominantly run by the national and international level, though, and there are few examples of local initiatives using local data/information. *All experience shows that local advocacy campaigns are more effective if they are linked to local data.*

The direct links between information and resource allocation in Thailand and South Africa have radically increased the potential for “internal” advocacy, where managers at lower levels use information to argue for higher budgets, more staff, better equipment, reforms, and so forth.

Different types of data are used for different types of advocacy. For instance, survey data, which provide aggregated prevalence and incidence indicators are commonly used for general sensitisation campaigns. Routine data would be more common as a source for local advocacy campaigns, for resource allocation (budget) campaigning, or for service delivery campaigns targeting health workers and patients.

### 7.5. Best Practices

Thailand and South Africa represent contrasting “best practices” compared to the typical poor state of HIS in developing countries. Thailand uses the web to maximum advantage and has a strong infrastructure, with flexible
standards at the periphery. South Africa has a flexible and consensus-driven minimum data set and an integrated district level data warehouse.

7.5.1. Thailand

In Thailand the Universal Coverage Scheme has been the driving force behind developing standard data sets and standard file formats for data transmission from local to national level. They have provided infrastructure in the form of servers, ADSL lines and software for the appropriate transmission of data to the national level as e-mail attachments (very robust). While the “critical” feedback from national to the provinces related to the payment of the contracting units is using the same robust mode of data transfer, the general feedback of indicators compared across districts and provinces is through the national web-server. Since the standard for data transfer is restricted to a file specification, any “carrier” can potentially be used; CD or memory stick, or e-mail, depending on what is available. Feedback using the web obviously favours those with web access, but since it is used in combination with electronic transfer and paper, it can be applied in any developing country. Servers and standard software for managing and transferring the required data and file-formats are provided to all, from contract units and provinces to central level. Patient and facility data as well as other information needs are collected and maintained by numerous NON-standardised, locally developed software applications.

By NOT enforcing the technical standards further down the system than the Contracting Units and the provinces, meaning NOT trying to standardise too much, the major pitfall causing failures in industrialised as well as developing countries is eliminated. Developing countries are characterised by uneven development of infrastructure and human resources between and within region/provinces, which calls for a flexible approach when attempting to implement and “scale” technical standards. Thailand provided all province head quarters and contracting units with the needed computer infrastructure when the system was rolled out. Following this robust model; the more peripheral levels may be in any state of development and any combination of paper and computer based system may be used, but the overall system will still work as long as the “carrots” are in place to submit quality data.

Countries can learn from Thailand:

- To develop computerised HIS infrastructure for reporting, feedback and dissemination of data and information
- When implementing wide-scale technical standards, i.e. computerising their HIS down to the level at which computerisation is needed.
7.5.2. South Africa

In South Africa the District Health Information Software (DHIS) has been successfully used in the evolutionary development of the national indicator and data sets (NIDS). Starting with a minimal set of 47 basic data elements in 1999, the national indicator list by 2005 contained 350+ indicators, all agreed by provincial representatives. Over the six years, national standards and provincial data sets for have been continuously changing. The application of the “hierarchy of standards” (see fig 1), which allows any level of the health system to implement the data standards they wish as long as they adhere to the standards of the level above, eased the tension between the relatively federal provinces. The provinces pursue their own interests as long as they adhere to the national essential dataset, thus balancing the local needs for flexibility and innovation and the central needs for control. This innovative process has been enabled by the DHIS, which adapts to the prevailing data and indicator standards. This has been possible because the DHIS is meta-data driven, meaning that data and indicators are revised at the textual and conceptual level, not at the programming and coding level. This is in stark contrast to most other surveyed software applications where revisions in data sets require programmer assistance and coding of the internal database structures and tables. As a consequence, in-flexible software “cast in stone” is in most cases a serious obstacle to the revision of data sets. IT, which should be enabling, is in fact constraining the innovative process of developing data and indicator standards. The paper forms and registers for data collection represent another serious “technical” obstacle to revising data sets, since they are already printed and distributed. A shortage of these paper forms (as seen for example in Ethiopia and Zanzibar) impedes the processes of implementing new standards.

The DHIS enables data collection forms to be printed at each point of use, based on the current data set, thus illustrating a key characteristic of the meta data driven approach; health professionals and not technical legacy systems are “in charge” when information needs are identified.

Most countries can learn from South Africa,

a) When focusing on the information needs based on data sets and indicators;
b) when attempting to standardise a country HIS that integrates local and national needs;
c) when using a flexible using an integrated “data warehouse” approach at the district level.
The DHIS shows that software can enable and not constrain processes of innovation and change. Most countries tend to start out with a focus on technical standards when attempting to standardise the country HIS. Unless applying the Thai model, this starting point is inappropriate in developing countries due to the uneven development of infrastructure. Paper and computers, internet and motorbikes as mean of data handling and transmission can easily be bridged as long as the data and indicators to be reported are standardised. If the “content” (i.e. the data level) is not standardised, standardisation of the “carrier” (i.e. the technical level;) will have no real impact.

7.6. The challenge of integration

Fragmentation is the major problem facing information systems in all countries assessed. With some exceptions, countries are saddled with institutionalised “vertical” programs, each collecting “their” information independent of other programs, with little regard for supporting the overall health information system. These vertical programs are usually donor-driven and well funded, so can collect large volumes of good quality data. However usually little priority is given to sustainability, so when donor funding dries up, the information system dies typically as a pilot project, and is abandoned, as there is no institutional base.

The result of this is excessive data, with great overlaps of the same data collected many times and large gaps where no data is collected. Furthermore, data and indicators are poorly standardised and represented in incompatible formats, making comparisons and analysis across program areas difficult.

Some programs such as HIV/AIDS are “strong” and collect a lot of quality routine data, supported by regular surveys, whereas others such as environmental health are “weak” and collect little, and poor quality data.

Increased integration is generally seen as the way to overcome fragmentation of country HIS. But, apart from it being an antonym to fragmentation, there is little shared understanding of what is meant by the term integration; of what should be integrated or of how integration may be achieved and at what level.

In the following sections a framework for understanding integration is presented, a three-level framework is outlined and each of the levels (organisational, data, technical) are explored further.
7.6.1. **A framework for understanding integration**

Typically, different professional groups have different meanings for the term integration; IT professionals will see technical integration, health professionals may think about integrating data sets and indicators, while policy makers may think organisational integration – or coordination.

When there is no clarity as to whether it is the messenger, the message or the sender/user/owner of the message that is the target for integration, integration is hard to achieve. Different objectives and methods are applied to the three levels of integration referred to by these metaphors; the technical level, the data or “logical” level, and the organisational/user level. These three levels which are outlined in Figure 1 provide a useful framework for understanding integration. The figure builds on a simplified version of the “seven layered OSI model” for integrating (technical) information infrastructure, onto which a data layer and the organisational “level” are included.

![Diagram](image)

**Figure 1.** The technical layers build on the seven layered OSI model. The data layer includes the hierarchy of (data) standards in figure 2. The “organisational layer” represents the, social, non-technical and user aspects of HIS integration.

Integration in the world of Information Systems means communication and interchange of relevant data within and between organizations. This is understood in terms of modularization and standardization. Vertical modularization –or integration- corresponds to traditional layering in software engineering where one layer offers services to the one above, as in figure 1. In the following we explore further some key issues related to the three levels.
7.6.2. Organisational coordination –Level 1

The 2003, a WHO-HIV/AIDS workshop reported: “Strengthening existing [HIS] in countries can be one of the positive externalities produced by ART programs.” For such HIS strengthening to happen, however, HIS efforts within the HIV/AIDS need to be coordinated with within the overall HIS network. Despite this top-level recommendation, the HIV programs implement their own HIS with no coordination with the existing HIS. They move in with their own staff, logistics, computers and software, while at the same time other programs have nothing (and are given nothing). As a result the overall HIS suffers and many core functions of the M&E process are weakened by an undue focus on HIV.

- In South Africa, the National HIS committee has been integrating different program activities and ensuring overall standards by focusing on data and indicator definitions and limiting the power of program managers to develop independent HIS activities.
- Thailand’s universal coverage scheme has been a major driver of integrated service delivery by getting all facilities to focus on key performance indicators and paying facilities according to reported outputs that cut across traditional “vertical” programs boundaries.
- In Vietnam, Ho Chi Minh City health department has rapidly moved forward to base its minimum indicator set around the MDGs, thus pulling together seven programs previously working independently of each other into one cohesive information system.

The Millennium Development goals offer one viable hope of a broad consensus on the “minimum essential data set” that health managers must know in order to manage key programs at the implementation level. All countries and all programs have agreed that these are the “core” indicators that all health workers must monitor and this approach can be used to integrate many existing vertical programs.

In many countries, consensus about the need to counteract the fragmentation is developing and they are moving towards an integrated district database warehouse approach:

- Botswana is moving from a fragmented information system towards an integrated district-based information system which will provide information directly to program managers at national level.
- Andhra Pradesh is now implementing a district database that will contain data from numerous formerly uncoordinated reporting systems.
- In Mozambique all relevant data, including financial, are collated at province level. Although the spreadsheet solution used is not optimal, consensus is there.
• In Zanzibar all data relevant to the health sector, including socio-economic surveys, are being pulled together in a district based database approach.
• In Ethiopia, a similar district database approach is fully implemented in Addis Ababa and partly implemented in other regions.

To sum up; cross sector consensus on counteracting HIS fragmentation is developing in many countries. The millennium development goals have sparked initiatives and the integrated district data warehouse approach seems to be pragmatic enough to appear as a “shared” resource, and thus help make operational the growing consensus.

7.6.3. Integration of data – level 2
Integration at the level of data and indicators is basically about standards and standardisation and should not pose major problems if there is strong leadership and political will. Development of essential national indicator and data – or national standards - is regarded as the key issue in country HIS reform. Most countries fail to achieve this goal. The reasons are:
1. Conflicting interests between health programs make it difficult to reach a “final” agreement.
2. Changes are the only constant as new needs keep popping up (e.g. HIV and the MDGs).
3. Multiple software and paper tools are difficult to coordinate and change; standards are “cast in stone”.

South Africa has managed over the past 10 years to develop national standards that are flexible enough to “absorb” changes over time – and local innovations. Why?
1. The application of the “hierarchy of standards” (see Figure 2) has been a powerful tool to negotiate a balance between the national needs for “control”, with the local needs for flexibility, or “more data”. While all health units are required to collect and report the “core” national data, they are at the same time allowed to pursue their own needs through additional data sets.
2. The flexible approach to standards in South Africa makes it easy to absorb and implement changes over time; there is no “final” data set. Local innovations are allowed for and may be included in the national data set if there is consensus that they are useful.
3. The flexibility of the South African District Health Information Software (DHIS) database application is the key to manage the “ever changing” national and local data sets. Data elements, indicators and data sets are
added, edited and managed by the health services themselves. The DHIS makes it possible to manage multiple data sets at the district and provincial levels. This “data warehouse” approach is a key to how the lessons from South Africa may be applied in other countries.

Figure 2. The hierarchy of data standards. Part of the data layers in figure 1. Flexibility is ensured by allowing for “freedom” horizontally, as long as standards are maintained vertically.

The assessment revealed that it has been difficult to mimic the consensus driven process in South Africa. In most countries there are national HIS databases and reporting formats, that are “cast in stone” and unable to respond to changes. This leads to fragmentation when individual programs develop their own data standards, software and paper tools. The well funded HIV programs move in with a non-integrated HIS and aggravate this situation.

The approach followed by Thailand differs in that the Universal Coverage Scheme has driven the consensus building process where the essential data sets are used for resource allocation using a data warehouse approach.

The data warehouse approach is to some extent violating the spirit of the South African minimum essential data set approach, by replacing it by a maximum one. That may be so, but it may be the best way to bring the South African lessons forward in a situation increasingly dominated by strong programs and multiple un-coordinated software applications.
7.6.4. Integration at the technical level

Integration is one of the most recurrent topics in the information systems and ICT literature. While there is no consensus on best practices and strategies, there are some general concepts that are necessary when developing a framework for HIS integration. Contemporary HIS development tends to be based on the world views and approaches of IT professionals rather than of health professionals, with an emphasis on “computerisation” and “networking” rather than on information needs and usage, it is necessary to know where and how these world views differ from or are aligned within an appropriate HIS perspective.

In Thailand the vertical integration has been successful because it was possible to establish adequate infrastructural conditions in each Contracting Unit and Province for reporting. Thus, by selecting the right level developing countries can develop a unified integrated infrastructure “down” to that level. This is the ideal to which all countries should aspire.

7.6.5. A summary – Priorities when integrating HIS

The priorities when integrating country HIS (as related to figure 1) are the following:

**Priority 1 – the organisational / user level:**
Ensure cross-organisational and program coordination and leadership of HIS development by health professionals. “Political” support and strong alliances are key issues to achieve consensus. The Millennium Development Goals represent a key set of indicators for cross-organisational collaboration.

**Priority 2 – the data level:**
Data integration should focus on developing essential data and indicator sets – flexible standardisation at the data level; following the hierarchy of standards (figure 2) and allowing for changes and innovation, using the MDGs as the “core”.

**Priority 3 – the technical level:**
Software applications and technical infrastructure must support and follow the requirements of the data and organisational /user levels. Flexible approaches to standardisation and horizontal integration are the key issues. In the world of HIS, change is the only constant, therefore:
- Database applications and “systems” need to be flexible and able to absorb changes continuously.
• The technical parts of the HIS must be flexible and scalable in order to adapt to any infrastructural condition and “scale” with them as they evolve and change.

7.7. Conclusions
Despite the generally bleak situation, we saw several examples of practical initiatives to integrate the HIS at both the district and national level. For example,
1. Botswana is implementing and testing an integrated “data-warehouse” approach. Since all data flows through the district, integration is relatively simply achieved by capturing or importing this data in one database and reporting data-files electronically into a similar database at the national level, from which data is exported to other systems.
2. In Mozambique, the donor community and health authorities are addressing the problem of fragmentation through a quarterly provincial planning approach where key indicators are made available across programs and services alongside financial data from all districts.
3. In South Africa, the fragmentation / integration dichotomy has been addressed through the development of a national standard essential indicator set which is crosscutting all health program and services areas.
4. Thailand is already far down the integration road through use of a standard file format to report activities for payment from the health Insurance scheme, from the local units to central level.

The general approach to achieve integration and to move away from fragmentation is threefold:
1. Developing organisational consensus on the need for integration among all relevant stakeholders, through representative country HIS committees, agreed standards for health insurance or the Millennium Development goals.
2. Standardisation of data sets and the elaboration of a comprehensive national indicator set that enables sharing of similar information across program and service areas.
3. Availability of data at one point to make data from multiple sub-systems available, through a unified data warehouse framework (“tight” integration) or a web portal (“loose” integration). Given the poor ICT infrastructure in developing countries and the dominance of paper based reporting systems, a data repository /data warehouse approach is suggested as the most appropriate strategy.
7.8. **Annex: Assessment tool**

The grading is from 0 representing No / None to 3 representing Yes/fully adequate. *As far as possible, each situation that the four values 0-1-2-3 should represent has been specified.*

The arithmetic average of all applicable scores, usually expressed as a percentage, is to be used.

### 7.8.1. **CONTEXT AND RESOURCES**

#### Legal and regulatory framework

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<thead>
<tr>
<th>Score (0= No to 3= Yes)</th>
<th>0 1 2 3</th>
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<tbody>
<tr>
<td>The country has recent legislation providing the framework for integrated collection, processing and use of health data, development planning, and HIS infrastructure development e.g. access to information, e-governance, electronic exchange of data, and electronic security measures. (0: No, existing legislation is outdated or woefully inadequate; 1: Basic legislation exist, but not the regulatory framework; 2: Basic legislation and a regulatory framework exist, but not the resources and/or political/administrative will to implement them; 3: Yes)</td>
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<tr>
<th>Score (0= No to 3= Yes)</th>
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<td>There is a written HIS strategic plan in active use that emphasises integration of different data sources a) at the national level b) in a modified form at most sub-national areas and districts (0: No; 1: The strategic plan exists, but it is not used or is not pro-integration; 2: The strategic plan exist, but the resources to implement it are not available; 3: Yes, it exists and are being implemented)</td>
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<th>Score (0= No to 3= Yes)</th>
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<td>There is a representative national HIS committee that actively encourages and supports research and development, innovation and an “entrepreneurial spirit” at all levels, thereby creating a balance between innovation and standardisation. (0: No, all important decisions are centralised; 1: Local innovation and R&amp;D are allowed, but must be authorised on beforehand; 2: Local innovation and R&amp;D are generally sanctioned, but the national HIS committee are mostly following external advice (“stargazing”); 3: Yes)</td>
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<th>Score (0= No to 3= Yes)</th>
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<tr>
<td>The national sets of goals, objectives, indicators and data elements are following international standards (0: No; 1: International standards and objectives are only considered in an ad-hoc manner; 2: Yes, but national innovations and views are generally not used as input to the same international standardisation processes; 3: Yes, work on standards are flowing both ways)</td>
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Human resources

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<td>There are adequate numbers of dedicated <strong>HIS staff</strong> in approved posts at each level</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<tr>
<td>a) Full time Epidemiologist in HIS office in each subnational area</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<tr>
<td>b) District <strong>Information Officers</strong> (DIOs) functioning in every district</td>
<td>0</td>
<td>1</td>
<td>2</td>
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(0: No; 1: Up to 40% have epidemiologist / permanent DIOs; 2: 40-80% of have adequate staff; 3: >80% have adequate HIS staff)

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<tr>
<td>There are one or more “hot-lines” for HIS and IT support available at national, sub-national, and district levels</td>
<td>0</td>
<td>1</td>
<td>2</td>
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(0: No hotlines available; 1: Hot-line(s) available only at national level; 2: Hot-line(s) available at all levels, but response time is slow; 3: Hot-line(s) available at all levels during HIS systems uptime hours (up to 24/7), providing on-the-fly support)

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<td>HIS staff at subnational/district level are able to <strong>modify and improve their HIS</strong> when changed circumstances (e.g. new programs, new information needs) make this relevant</td>
<td>0</td>
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(0: No, such skills are sorely lacking; 1: Huge variations in such skills are typical; 2: The majority have good knowledge, but still needs significant external support and further training; 3: Yes)

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<td><strong>Capacity building</strong> activities has occurred over the past year at <strong>district</strong> level</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<tr>
<td>a) for HIS staff (statistics, software and database maintenance, and/or epidemiology)</td>
<td>0</td>
<td>1</td>
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<tr>
<td>b) program managers (epidemiology, report writing, information management)</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c) health facility staff (data collection, self-assessment, analysis, presentation)</td>
<td>0</td>
<td>1</td>
<td>2</td>
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(0: No; 1: Limited capacity building; 2: Significant capacity building, but largely depending on external (e.g. donor) support and input; 3: Significant capacity building occurred as part of a long-term government-driven HRD plan)

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<tr>
<td>Capacity building activities has occurred over the past year at <strong>national</strong> level for program managers (epidemiology, report writing, information management)</td>
<td>0</td>
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(0: No; 1: Limited capacity building; 2: Significant capacity building, but largely depending on external (e.g. donor) support and input; 3: Significant capacity building occurred as part of a long-term government-driven HRD plan)

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<tbody>
<tr>
<td><strong>Written guidelines</strong> exist defining how facility supervisors and district managers should use information and integrate it into overall health service management</td>
<td>0</td>
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(0: No guidelines exist; 1: Written guidelines exist but are not implemented/used; 2: Written guidelines exist and are used, but not integrated into overall service supervision; 3: Yes)
## Finances

<table>
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<tr>
<th>Question</th>
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<tbody>
<tr>
<td>There is a specific national government budget for core funding of HIS activities</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>(0: No; 1: Yes, but mainly covering salaries and basic recurrent expenditure for existing staff; 2: Yes, but the budget allocations are not based on a long-term strategic HIS plan; 3: Yes, with both recurrent and capital budgets based on a long-term strategic plan)</td>
<td></td>
</tr>
<tr>
<td>Donor funds for HIS developments are “untied” and channelled through a consolidated fund within the national ministry (and/or sub-national ministries in federal systems)</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>(0: No, donors pick projects with limited co-ordination and funds are often tied to goods and services from the donor country; 1: There is no consolidated fund(s) and often tied aid, but mechanisms for government co-ordination are in place; 2: There is a consolidated fund, but not all donors participate and/or significant funding are “tied”; 3: Yes)</td>
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</tr>
<tr>
<td>There is a specific district budget for HIS activities in at least 80% of all districts</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>(0: No, HIS expenditure (if any) are centrally controlled; 1: Yes, but mainly covering salaries and basic recurrent expenditure for existing staff; 2: Yes, but the budget allocations are not based on a long-term strategic HIS plan; 3: Yes, with both recurrent and capital budgets based on a long-term strategic plan)</td>
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<tr>
<td>The district budget is able to cover the cost of providing facilities with locally customised primary data collection tools (registers, summary sheets, etc)</td>
<td>0 1 2 3</td>
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<tr>
<td>(0: No, many facilities do not have primary data collection tools; 1: There is a budget line for it, but it is not sufficient to satisfy the needs; 2: Districts rely on higher levels to provide all data collection tools (i.e. no local customisation); 3: Yes)</td>
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## Health Information Infrastructure / Computerisation

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<tr>
<td>A complete and up to date national facility list exists for the public sector</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>a) in regular use at national level</td>
<td></td>
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<tr>
<td>b) data on infrastructure and human resources for each facility</td>
<td></td>
</tr>
<tr>
<td>c) geographic coordinates available for each facility</td>
<td></td>
</tr>
<tr>
<td>(0: none at all; 1: list very out of date or covers &lt;50%; 2: Up to date for 50-80%; 3: yes)</td>
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</table>
The basic computerised information communication infrastructure (PCs, email, Internet & Intranet access) are in place
a) at the national level 0 1 2 3  
b) at the sub-national level 0 1 2 3  
c) at the district level 0 1 2 3  
d) at facility level 0 1 2 3  
(0: Only a minority of managers have access to a PC; 1: Most managers have access to a PC but no email; 2: Nearly all managers have access to a PC and the Internet; 3: Yes)

Technical IT support (networks, installation, repairs, general hardware/software maintenance) is available and functional with acceptable response times
(0: Technical IT support generally not available; 1: Technical IT support available, but response/repair/replacement times are often 2 weeks or more; 2: Technical IT support available, but response/repair/replacement times are usually from 3 days to 2 weeks; 3: Technical IT support available with response/repair/replacement times usually less than 3 days)

Routine, semi-permanent, and survey data are in generally captured at the district level and submitted electronically via email or other networks
a) to higher levels 0 1 2 3  
b) to the national level 0 1 2 3  
(0: No, generally reports are on paper; 1: Data is captured and submitted on diskettes; 2: Data is captured and submitted by email or similar; 3: Data is captured locally but stored in or automatically submitted to national servers)

Integrated HIS data and analysed information are readily accessible by managers through Internet / intranet
(0: No; 1: Some published reports etc are available; 2: Both raw data and processed information are available, but only to users physically connected to the government Intranet; 3: Both raw data and processed information are available, either via the government Intranet or via the Internet with appropriate access control/firewalls)

The HIS unit at national level is running one integrated HIS database or “data warehouse” containing data and information from all key health programs
(0: No; 1: There is no integration, but key health data/information are presumably available from the HIS unit in whatever format available; 2: There is a “data warehouse”, but its content are not functionally integrated/streamlined to support transparent, integrated analysis; 3: Yes, there is a “data warehouse” containing most relevant health data sets with common format and identifiers.)
Integrated systems equivalent the national HIS database or “data warehouse” are running at sub-national and/or district levels (0: No system integration at sub-national and/or district levels; 1: Limited system integration at sub-national and/or district levels; 2: Equivalent system integration at sub-national and/or district levels; 3: Equivalent system integration at sub-national and/or district levels and sub-national/district managers have access to the national “data warehouse” via the Intranet/Internet enabling vertical collaboration via ICT)

The unit is formally, legally and practically able to modify by adding/changing data elements and indicators, reports etc. to the national and sub-national HIS database or “data warehouse” without external support (0: No, programs are not flexible; 1: 2: 3: Yes)

A patient based Electronic Health Record system is running at facility level in the public health sector for key MDG programs (e.g. EPI, PMTCT, ARV, TB) (0: only by private company/international consultants; 1: minor modifications can be done within limits prescribed by software owner/consultant; 2: Significant modifications, but within limits; 3: Any modification can be done because software is open source or software owner has provided source code.)

### 7.8.2. PROCESS

**Data management**

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<th>Score (0= No to 3= Yes)</th>
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<tr>
<td>There are written guidelines for how information from HIS should be used at different levels</td>
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<td>a) in the annual planning processes</td>
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<td>b) in the annual budget process</td>
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<td>(0: No; 1: Yes, but they are outdated and/or not suitable; 2: Yes, but there are several often contradictory sets of guidelines and regulations from different ministries; 3: Yes, up-to-date streamlined guidelines are in use)</td>
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<tr>
<td>Up-to-date HIS Data from all subsystems and programs (including MDGs) is easily available at one point in the ministry of health</td>
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<td>(0: Data not available 1: Data available, but with difficulty 2: Data available, but not systematically 3: Yes )</td>
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<tr>
<td>The ministry is actively promoting integration of data / information from different sources and programs under the HIS unit at all levels</td>
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<td>(0: No; 1: Integration is only pursued at the (sub-)national level; 2: Integration is pursued from the district level and upwards; 3: Yes, integration is pursued at all levels including facility levels)</td>
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There are written procedures for dissemination of reports/information “horizontally” to all program areas and management at the same level at least on a quarterly basis  
(0: No written procedures and negligible “horizontal” dissemination; 1: There are no written procedures, but dissemination are common practice; 2: There are written procedures, but they are not fully implemented; 3: Yes, written procedures exist and are largely followed)  

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Health managers are generally demanding complete and validated HIS information delivered on time  
(0: Negligible demand from managers; 1: Demand from managers are ad-hoc, usually as a result of external pressure (e.g. questions from politicians or the media); 2: General strong demand from managers, but they do not have the skills and experience to evaluation completeness and quality; 3: Yes)  

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Anonymous HIS data and indicators are in principle regarded as belonging in the public domain, i.e. it should be available to all interested citizens  
(0: Access is strictly controlled; 1: Public access accepted in principle, but not implemented in practice; 2: Public access accepted in principle and largely implemented; 3: Public access and availability are guaranteed by law/regulations and fully implemented)  

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**Plans and indicators**

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| A national Essential/Minimum Indicator and/or data Set has been implemented in the public health sector  
(0: None exist; 1: Exist but not implemented; 2: Data Set only implemented; 3: Yes) | | | | |
| All indicators in the national Essential/Minimum Indicator Set are linked to the relevant short (1 year), medium (3-5 years), and long-term (10-15 years) targets  
(0: No targets; 1: Under 40% of indicators have targets; 2: 40-80% of indicators have targets; 3: All indicators have relevant targets) | | | | |
| The national Essential/Minimum Indicator and/or data Set has also been implemented in the private for-profit and private not-for-profit health sectors  
(0: No; 1: Exist but not implemented; 2: Data Set only implemented; 3: Yes) | | | | |
| The national Essential/Minimum Indicator Set contains all the 15 health-related MDG-indicators  
(0: None; 1: Eight or less; 2: Eight or more but not all; 3: Yes) | | | | |
Program Managers at all levels have to get broad acceptance for any extensions or additions to the accepted Essential / Minimum Indicator/Data Set via a consensus-building process
(0: Each program demands data as they see fit; 1: There is a policy or guidelines in place, but it is not enforced; 2: Most, but not all program managers have accepted the consensus-building process as a pre-requisite for introducing new data/indicators; 3: New indicators/data elements cannot be introduced without such a process and formal acceptance by the responsible management team)

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<tr>
<td>All key indicators, with numerators and denominators, are known and understood by program staff a) at the national level b) at the sub-national and district levels (0: No; 1: Limited knowledge/understanding, need continuous support; 2: Good knowledge/understanding, but need backstopping; 3: Yes)</td>
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**Data sources**

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<tr>
<td>All managers at the national level have easy, regular access to the Health Information Systems data and analysed information (0: No or very limited access; 1: Access to data/information for their own program area only; 2: Sector wide access, but only to processed data/indicators and not “raw” data; 3: All managers have access to all data and information)</td>
<td>0</td>
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<tr>
<td>There are user-friendly guidelines and formats for data analysis using indicators at each level, customised to support the paper-based or computer-based systems in use (0: No guidelines or formats; 1: Brief guidelines exist, but not user-friendly and/or outdated; 2: User-friendly guidelines exist for technical analysis only; 3: User-friendly guidelines and formats covering both technical analysis and use of indicators for planning and decision-making exist and are in regular use)</td>
<td>0</td>
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<tr>
<td>Population mid-year estimates for use as denominator data are available electronically for facility, district and sub-national level (0: No mid-year estimates available in electronic format; 1: Mid-year estimates available at sub-national level; 2: Mid-year estimates available at district level; 3: Mid-year estimates at facility level (facility catchment and/or target populations);</td>
<td>0</td>
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<tr>
<td>Data from non-ministry of health surveys is easily available in the ministry of health within the HIS framework a) Household surveys e.g. Demographic and Health Survey b) Vital registration (births and deaths) c) Socio-economic and poverty reduction data d) Literacy and Universal Basic Education (0: Not available 1: Limited availability or out of date 2: Available, but not directly in HIS framework 3: Yes – used for denominators)</td>
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### 7.8.3. RESULTS

#### Analysis and Use of Information

<table>
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<tr>
<th>Information Type</th>
<th>Description</th>
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| **Summary reports** covering key indicators and program areas are produced regularly (monthly/quarterly) at | a) district/sub-national levels  
b) at national level  
(0: No reports produced during last year; 1: Few reports; 2: Regular reports, but usually too late for routine management; 3: Yes, always) | 0 1 2 3  
0 1 2 3 |
| **Graphs are widely used to display information:** | a) Each health program has at least two **up-to-date graphs** of relevant indicators displayed publicly in the national office  
b) The national health Information office has at least 6 up-to-date graphs of relevant indicators from different MDG program areas  
c) Subnational / District offices have up to date graphs displayed  
(0: No graphs; 1: Some graphs, but not up-to-date; 2: Up-to-date graphs displayed, but only for some programs; 3: Yes) | 0 1 2 3  
0 1 2 3 |
| **Maps (GIS or hand drawn) are widely used to display information:** | a) A GIS is used and maps of relevant indicators are displayed publicly in the national office  
b) Sub-national offices have up-to date maps of relevant indicators from different MDG program areas  
c) Subnational / District offices have up to date maps displayed  
(0: No maps; 1: Some maps, but not up-to-date; 2: Up-to-date maps displayed, but only for some programs; 3: Yes) GIS / Maps are used at every level | 0 1 2 3  
0 1 2 3  
0 1 2 3 |
| There are incentives for good information performance, such as awards for the best service delivery performance, for the best/most improved district, or for the best HIS products/utilisation | (0: No; 1: Sporadic use of incentives only; 2: Institutionalised use of incentives in some areas; 3: Yes) | 0 1 2 3 |
| Managers are held accountable for performance, based on routine and/or survey-based health indicators at | A) National level  
B) District level  
(0: Management positions not performance related; 1: Managers have performance agreements, but nobody are actually held accountable; 2: Managers have performance agreements, but actual accountability are determined by other factors; 3: Yes) | 0 1 2 3  
0 1 2 3 |
| | Available and relevant data from census, household surveys, ad-hoc surveys and research reports are used in an integrated way for indicator evaluation and cross-checking  
(0: No cross-verification done; 1: Occasionally; 2: Commonly done, but only as a “manual” process because data formats and identifiers do not match; 3: Commonly done using multiple data sources that have been aligned to a common framework and format for ease-of-use in integrated analysis) | 0 1 2 3 |
|---|---|
|Dissemination of Indicators and Interpreted Information|There is a written **data/information flow policy** in active use that includes integrated collection and dissemination of indicators and interpreted information from all key subsystems  
(0: No data/information flow policy; 1: Data/information flow policy exists, but is not adhered to; 2: Data/information flow policy in use, but it does not include dissemination of indicators and interpreted information ; 3: Yes) | 0 1 2 3 |
| | Integrated HIS **summary reports** covering (at least) key MDG health indicators and program areas are distributed regularly (at least every 3 months) to  
 a) other ministries and elected bodies at national level  
 b) to the media and the general public at national level  
(0: No integrated reports; 1: Occasional reports, but less frequently than quarterly; 2: Regular integrated reports at least quarterly, but mainly targeting the National Assembly and Cabinet; 3: Regular integrated reports at least quarterly to the National Assembly and all other relevant ministries) | 0 1 2 3 |
| | Management teams are producing regular written **feedback** from  
 a) National to sub-national managers  
 b) Sub-national to district  
 c) District to facility  
(0: No feedback; 1: Under 40% of sub-national units receive regular written feedback; 2: 40-80% of sub-national units receive regular written feedback; 3: All sub-national units receive regular written feedback) | 0 1 2 3 |
| | Key data and indicators from across program areas are readily available through an **integrated database** framework  
 a) within the health sector  
 b) within the government sector (a “National Statistics Framework”)  
(0: No data warehouse; 1: Data warehouse exist, but not web-enabled; 2: Web-enabled data warehouse exist, but only internal ministry access; 3: Web-enabled data warehouse exist, with at least partial public access via the World Wide Web) | 0 1 2 3 |
Anonymous data and indicator sets from the health sector (public and private) are **generally available** (at a reasonable price) to any interested user (patient-identifiable data sets obviously excluded)

(0: No data available 1: Annual report of ministry available in all districts 2: Data available on paper, but have to make major effort to get it 3: Most data easily available via web)

**Information for action**

Managers at all levels are able to, and actually use information from HIS for local program **management**, planning and monitoring

(0: All key decisions are centralised; 1: Information used for monitoring, but no real planning done; 2: Program planning and monitoring done, but not resource allocation; 3: All resource allocation (budgets, staff allocations) are supposedly based on HIS data/indicators)

HIS data/information has during the last 5 years resulted in significant changes in annual **budgets** and/or general resource allocation

(0: Budgets are not activity/result driven; 1: Some shifts, but links to information not clear; 2: Information driven resource allocation adopted in principle, but not yet fully implemented; 3: All resource allocation (budgets, staff allocations) are based on HIS information, resulting in major shifts)

At least five problems/challenges from different program areas have been addressed through a **written action plan** based on HIS data/indicators

(0: No; 1: Addressed yes, but not via a written action plan; 2: Written action plan, but no clear use of HIS data/indicators; 3: Yes)

The effects of the written action plans have been demonstrably **monitored** using integrated HIS data and indicators from different subsystems

(0: No; 1: Partially; 2: Yes, but not documented; 3: Yes, documented)

**Advocacy**

HIS information are widely used to advocate for targets and resource allocation in the annual budget processes

a) by national management teams with **Cabinet and the National Assembly**

b) by **district and sub-national** management teams

(0: very few targets/budget proposals are backed up by HIS information; 1: Some (10-40%) of targets/budget proposals are backed up by HIS information; 2: Most (40-80%) of targets/budget proposals are backed up by HIS information; 3: Over 80% of targets/budget proposals are backed up by HIS information)
HIS information is readily available in a written annual (or biannual) report that pulls together and analyses critically health information from all subsystems (0: No report 1: Report out of date or poor quality 2: Report made but analysis weak 3: Yes)

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HIS information are being used to advocate for equity and increased resources to disadvantaged groups and communities by e.g. documenting their disease burden as linked to socio-economic indicators (e.g. poverty) and poor access to health services and other public services (0: Not used for equity purposes; 1: HIS information are used for equity purposes on an ad-hoc basis; 2: HIS information are regularly used to promote equity, but not explicitly linked to quantifiable socio-economic indicators; 3: HIS information are systematically used to pursue equity and linked to socio-economic and/or access indicators as part of a National Statistical Framework)

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The key national performance indicators on MDGs are well known among politicians and regularly used by the media

| a) Under 5 mortality rate is well known | 0 | 1 | 2 | 3 |
| b) National immunisation coverage is well known | 0 | 1 | 2 | 3 |
| c) Maternal mortality rate is well known | 0 | 1 | 2 | 3 |
| d) HIV prevalence rate is well known | 0 | 1 | 2 | 3 |

(0: No; 1: Known by a few “specialists” only; 2: Known among health-focused politicians, but generally not in the media; 3: Yes)

Members of the National Assembly have regularly used HIS information to evaluate government performance on health during the last year (0: No; 1: HIS information used occasionally, but with clear reservations due to completeness or quality of data; 2: HIS information used frequently, but with reservations or disagreements due to completeness or quality of data; 3: Systematic use of HIS information, with most Assembly Members accepting the HIS information as largely reflecting the real situation)

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8. Social, ethical and legal issues

Caroline Ncube\textsuperscript{38}, Corien Prins\textsuperscript{39}, Waudo Siganga\textsuperscript{40}

8.1. Introduction

In a rather short period of a little over a decade, information and communication technologies have become ubiquitous in the western world. In the early 1990s, few people had heard of email or the Internet. Ten years later, these technologies have become institutionalised and common-place. It is hard to grasp the influence of this on society. But in more ways than one, the world functions differently from about couple decades ago. This affects the laws, social development and ethical notions. A glance at recent developments in developing countries shows that ICTs are slowly starting to play a key role in economic and social change. If the experiences of the western world are any guide, the rise of ICT in developing countries will also have a fundamental influence on ethics, regulatory challenges and social life.

This chapter focuses on ethical, legal and social aspects of the introduction and use of ICT in developing countries. The following sections will address the topics that are currently on the agenda of the Commission on Ethical, Social and Legal Aspects. This chapter brings together the topics and challenges, the aims of the projects that address these challenges along with the relevant background information and the relevant literature. Some topics have been dealt with in more detail than others, depending on the stage of the project initiated by the Commission. The topics discussed are:

- identity theft (section 2)
- self-regulation and code of ethics in the information society (section 3)
- the use of ICT in the judiciary (section 4)
- women’s MDG Portal (section 5)
- e-learning tools for lawyers and judges (section 6)

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\textsuperscript{39} University of Tilburg, Netherlands

\textsuperscript{40} Computer Society of Kenya, Kenya
8.2. Identity Theft

8.2.1. Aims of the project

One of the projects initiated by the Commission on Ethical, Social and Legal Aspects focuses on the challenging legal and regulatory implications of the new phenomenon of identity theft for South African society. Being a new type of crime, identity theft (or better formulated as identity fraud) reveals itself in a variety of ways, with or without the use of technology and has become a significant societal problem in various countries around the world, in particular the United States. The European countries have also begun waking up to it. In South Africa as well it is often claimed that this crime will soon become a threat to society. However, it has never been adequately substantiated and little research has been conducted into the question whether the situation in the United States and Europe (i.e. the vulnerability of their national identification schemes to identity theft) can be compared to the South African. Given the lack of sufficient knowledge about the way ID theft is unfolding in South Africa, it’s not readily comparable to that of victims in other countries. The central question is twofold: first, given the characteristics of identification schemes and the techniques and procedures used in South Africa as well as relevant social and cultural factors, what are the actual risks of people becoming a victim of identity theft? Second, what should be the subsequent (regulatory) response to protect people from becoming a victim of this crime or helping victims in dealing with the consequences of the crime?

Suggestions to eliminate the occurrence of ID-theft will provide a significant societal contribution and have a positive influence on trust in digital communication and new services. Through the results, businesses, governments, and consumers may develop a better understanding of how their use of technological applications provides a facilitating role for perpetrators to commit identity theft. This understanding, along with the subsequent recommendations for appropriate policy action, will then contribute to preventing identity theft in the future or at least reducing its occurrence. At the 2007 WITFOR conference, several presentations focused on ID-theft in South Africa. One talk was given by Reinhardt Buys, attorney and managing director with Buys Inc. Attorneys, Cape Town, South Africa, who specializes in Internet, Media and IPR law. Buys addressed the challenges South Africa faces with identity theft, the measures taken so far and the future challenges, including in light of the 2010 Soccer World Cup. Subsequently, Sonia Camacho, a lawyer trained in the UK, presented a comparative analysis of government initiatives and legislation to combat ID-theft in the United States, United Kingdom and South Africa. The
presentations will be used for further study under this project. In the meantime, the Commission’s proposal to the South Africa-Netherlands Research Programme on Alternatives in Development (SANPAD) to take the research in the area of ID-theft further has been approved and funded.

8.2.2. Specific questions dealt with in the ID-theft project
Given the afore-mentioned central question of this project, the Commission on Ethical, Social and Legal Aspects has formulated the following aims to be realized, given the identification schemes and techniques used in this country as well as possible relevant social factors:

- Obtain an adequate understanding of the actual risks of people becoming a victim of financially related identity theft in South Africa, given the identification schemes and techniques used in this country as well as possible relevant social factors;
- Obtain a better perspective on the position of victims of this type of identity theft in South Africa;
- Survey the present South African legal framework to see to what extent it regulates this crime;
- Outline the initiatives of the financial services sector in SA in response to this crime;
- Undertake a comparative analysis of US and European responses to this crime;
- Make meaningful and realistic recommendations for legislative, regulatory or other policy (public awareness campaigns, participation in international advisory groups, fraud hotline) initiatives in SA.

8.2.3. Background
The introduction of digital communication technologies has offered businesses, financial service providers, and governments with the opportunity to offer their services online without the need for face-to-face interaction. Consumers warmly welcome these new services. South Africa is in the early stages of this development. Along with the advantages they offer, the digital services also pose new security problems. Without face to face contact, identification in the online world requires other means of verification, which pose different and more complex challenges than in the offline world. The problem of identity theft in several countries around the world is a clear indication that financial service providers, businesses, governments, and consumers have yet to incorporate adequate measures to counter these challenges.
When considering the extent of the identity fraud problem, surveys show a steady increase in reported losses from identity theft over the past years, in particular in the United States.\(^{41}\) Electronic Fund Transfer related identity theft was the most frequently reported type of identity theft bank fraud during calendar year 2005.\(^ {42}\) In South Africa, there have been several reports on this crime and the estimated losses run into millions.\(^ {43}\) However, when one tries to obtain really accurate data about the prevalence of identity theft, this appears to be problematic. A theft bank fraud during calendar year 2005 reported on losses, however an overall and good picture of the size of the problem is lacking.\(^ {44}\) A prime reason is that hardly anyone agrees on a standard definition of the phenomenon. Nonetheless, discussions about the accuracy of the data hardly overshadow the more pressing need to acknowledge how identity theft is, and in some parts of the world will become, an important social and economic problem.

Many experts believe that the potential threat of identity theft in SA is increasing. These beliefs or convictions, however, are largely based on observations about experiences from abroad and in that regard highly speculative. Academic research about the current and potential future

\(^{41}\) A January 2006 report based on data collected by the Consumer Fraud and Identity Theft Complaint database, mentions that the US Federal Trade Commission received between January and December 2005 over 685,000 consumer complaints - 63% represented fraud and 37% were identity theft complaints. Consumers reported losses from fraud of more than $680 million. Credit card fraud (26%) was the most common form of reported identity theft followed by phone or utilities fraud (18%), bank fraud (17%), and employment fraud (12%). Other significant categories of identity theft reported by victims were government documents/benefits fraud (9%) and loan fraud (5%).

\(^{42}\) These and other data are collected by Consumer Sentinel, a complaint database developed and maintained by the FTC. Consumer Sentinel collects the information about consumer fraud and identity theft from the FTC and over 150 other organizations and makes it available to law enforcement partners across the United States and throughout the world. They may use this information in their investigations. Launched in 1997, the Sentinel database now claims to include almost three million complaints.

\(^{43}\) For example IOL Technology.co.za ‘SA Identity theft on the rise- report’ http://www.ioltechnology.co.za/article_print.php?iArticleId=3556628

\(^{44}\) These and other data are collected by Consumer Sentinel, a complaint database developed and maintained by the FTC. Consumer Sentinel collects the information about consumer fraud and identity theft from the FTC and over 150 other organizations and makes it available to law enforcement partners across the United States and throughout the world. They may use this information in their investigations. Launched in 1997, the Sentinel database now claims to include almost three million complaints.
problems of identity theft in South Africa is unavailable. While lessons from abroad can serve as a useful guide, primary research is necessary to identify vulnerabilities within South Africa which can facilitate identity theft. Another key reason why we have insufficient knowledge of the actual risks of identity theft, and subsequently the impact of these risks on victims in South Africa, relates to the fact that the scope of these risks most likely depends on various contextual factors. In other words, contextual factors have to be taken into account in exploring identity theft perceptions, practices and challenges and the subsequent regulatory response to protect people from becoming a victim of this crime or helping victims in dealing with the consequences of the crime. Examples of such contextual factors may be the specifics of a certain national (here: South African) identity infrastructure; the existing national procedures for the issuance of identification schemes (such as social-security numbers and credit cards) and possible relevant social factors (such as the social or educational background of people that make them more vulnerable to identity theft, and cultural factors impacting on means and procedures of identification).

For this project, the answers will primarily be derived from existing literature about identity theft, the experiences and counter-measures abroad to establish a guiding framework for the rest of the research. The study of developments abroad does not aim at doing comparative legal research, rather, at gaining insights and inspiration from their experiences, and hence, is restricted to literature research and organizing an international workshop. For the analysis of the present legal framework in SA, the research will be based on a study of the relevant legal and regulatory mechanisms. The literature research will be supplemented with some additional qualitative empirical research. The latter is required because the incidence of financial identity theft in SA is virtually unknown, and hard to determine because it is not registered by the judicial authorities as such. For the latter reason, the empirical research for SA will be qualitative, through expert interviews and several workshops. Finally, expert interviews will also be used for gaining an understanding of how particular factors in society enable identity theft to occur.

8.3. Self-regulation and code of ethics in the information society

8.3.1. Aims of the project

On 10-12 December 2003, the International Telecommunication Union (ITU) in Geneva organized the first phase of the World Summit on the Information Society (WSIS). This world summit was endorsed by the
General Assembly of the United Nations (Resolution 56/183, 21 December 2001). The ITU was mandated with the leading role in the organization of the WSIS. The summit addressed a broad range of themes concerning the information society, and a Declaration of Principles and a Plan of Action were adopted (the second meeting was held at Tunis in November 2005).

In the Declaration of Principles, the key principles for building an inclusive information society were outlined (available at <http://www.itu.int/wsis/documents/>), one of these being an enabling environment. In this context, the Declaration of Principles states that:

**the rule of law, accompanied by a supportive, transparent, pro-competitive, technologically neutral and predictable policy and regulatory framework reflecting national realities, is essential for building a people-centered Information Society. Governments should intervene, as appropriate, to correct market failures, to maintain fair competition, to attract investment, to enhance the development of the ICT infrastructure and applications, to maximize economic and social benefits, and to serve national priorities.**

Furthermore, within the context of the key principle to create an enabling environment, the Declaration of Principles pays attention to governance issues and also leaves room for self-regulation:

**The management of the Internet encompasses both technical and public policy issues and should involve all stakeholders and relevant intergovernmental and international organizations. In this respect it is recognized that:**

- **a)** Policy authority for Internet-related public policy issues is the sovereign right of States. They have rights and responsibilities for international Internet-related public policy issues;
- **b)** The private sector has had and should continue to have an important role in the development of the Internet, both in the technical and economic fields;
- **c)** Civil society has also played an important role on Internet matters, especially at community level, and should continue to play such a role;
- **d)** Intergovernmental organizations have had and should continue to have a facilitating role in the coordination of Internet-related public policy issues;
- **e)** International organizations have also had and should continue to have an important role in the development of Internet-related technical standards and relevant policies.

Thus, it appears that governance is a joint effort of public and private parties. “Governments, as well as private sector, civil society and the United Nations and other international organizations have an important role and
responsibility in the development of the Information Society and, as appropriate, in decision-making processes.” There should be “a mechanism for the full and active participation of governments, the private sector and civil society from both developing and developed countries, involving relevant intergovernmental and international organizations and forums, to investigate and make proposals for action, as appropriate, on the governance of Internet by 2005.”

To ensure that developing countries can fully participate in the global information society, attention must thus be given to the pros and cons as well as best-practices with respect to self-regulation. Further insight into best practices with respect to self-regulation may positively influence the enabling environment and policy frameworks needed to contribute to progress by mean of ICT in developing countries.

8.3.2. Specific questions dealt with in the project

In light of the afore-mentioned, the Commission on Ethical, Social and Legal Aspects considers it of utmost importance that effort is made to build sustainable self-regulation models for developing countries (DCs). These models need to be informed by best international practice and frameworks. Given this, this project aims to:

- Create a synergy between DC’s national regulatory frameworks and international frameworks;
- Encourage consistency in national self-regulation and strengthen DC’s regulation by providing capacity building resources;
- Add to the existing body of knowledge and support implementation and sustainability of these frameworks by establishing collaborative links between DCs and international organisations that can provide assistance and guidance.

In order to take these ambitions step by step, the Commission decided to first focus on self-regulatory initiatives for ICT security. At the WITFOR 2007 conference, Andreas Mitrakas (a senior policy advisor with the European Network and Information Security Agency (ENISA), Greece) discussed recent work of ENISA on ICT security and presented best practices for developing countries based on earlier self-regulation experiences in the European Union in the area of information security. The security issue is closely related to how people should behave in an online environment. Given this, Boyan Radoykov of UNESCO, Paris (France), presented and discussed a draft Code of Conduct on Ethical Issues related to ICT (drafted by UNESCO). He also touched upon the links with the implementation of WSIS Action Line C10 "Ethical Dimensions of the Information Society".
8.3.3. **Background**

In its most extensive form, self-regulation implies that private actors themselves implement the applicable norms and rules and, ideally, monitor compliance and enforce the rules in case of non-compliance. Self-regulation is, therefore, often used as an argument in proposing a system that is different from formal regulation by national governments or international regulatory bodies. However, many different forms of the concept emerged in the highly diverse areas in which self-regulatory initiatives have been implemented, varying from norms applicable to the environment, the media, and advertising, to diverse professional standards, such as those applied in the medical profession. Several of these forms play a key role in the area of ICT as well.

Self-regulation is often embraced as a highly attractive alternative to regulation by means of laws and other legislative acts. Proponents of self-regulation complain, for example, about the lack of flexibility of legislation and are skeptical about the feasibility of efficient and adequate ICT regulation by means of legislation. However, various imperfections and adverse consequences for the Internet are attached to self-regulation and there is certainly reason to question the adequacy and effect of self-regulation in certain circumstances. For example, in their enthusiasm for self-regulation, proponents often seem to overlook the difficulties that arise in relation to the enforcement of self-regulatory initiatives. Furthermore, who may advocate a leading role for self-regulation and for what reasons? In the domain of ICT regulation, what strengths and weaknesses of self-regulation can be noted? It is these and other questions that will be dealt with under the project.

8.4. **The use of ICT in the judiciary**

8.4.1. **Aims of the project**

The fourth project initiated by the Commission focuses on the ways in which the use of ICTs in the judiciary may enhance the transparency and quality of court rulings and the work of the judiciary. ICTs are used in many organisations to bring about change and transformation. One such organisation may be the judiciary. Many countries around the world introduced different forms of ICT support of the judiciary. Examples are electronic files to retrieve case information, exchange information between the courts electronically, access to Internet, different forms of courtroom technology, etc. A glance around the world shows that the actual level of
automation in the judiciary and thus the state of ICT support varies significantly. This project aims to research initiatives in developing countries on the use of ICT in the judiciary and thus discuss opportunities and challenges as well as provide best practices and lessons that can be learned from the experiences. At WITFOR 2007 Ato Menberetsehai Tadesse, the vice-president of the Federal Supreme Court of Ethiopia dealt with the use of ICT in the judiciary in Ethiopia. He discussed opportunities and challenges and based on the Ethiopian experiences provided examples of best practices. In addition, Michael M.Murungi, a Reporter with the Kenya Law Reports of the National Council for Law Reporting, Nairobi, discussed the aims and ambitions of the Kenya Law Reports <http://www.kenyalaw.org> and the vision of the Kenya National Council for Law Reporting to provide the latest and most relevant case law and other legal information by means of this initiative.

8.4.2. **Specific questions dealt with in the project**

The overall ambition of the Commission on Ethical, Social and Legal Aspects with the project is the conviction that in order to trigger the use of ICTs in the judiciary in developing countries, several questions play an important role and need to be answered:

- How is the judiciary organised in a specific country and what are the pressing problems in the judiciary?
- In what way could the use of ICTs enhance the transparency of the judiciary and court rulings (on-line services - publication of verdicts, legal databases, etc.)?
- In what way could the use of ICTs enhance the quality and objectivity of the judiciary and court rulings (indirect effect of transparency);
- What initiatives could be of particular importance in a given country:
  - (Pre-trial) case management – planning, etc;
  - Office automation
  - Electronic filing systems
  - Use of electronic documents
  - Video conferencing
  - On-line services - publication of verdicts, legal databases, etc.
- What benefits may be realised by using these and other ICT-initiatives in the judiciary?
- How would the use of ICT influence the work of judges, public prosecutors, etc.
The project could as a first step try to gain answers to some or all of the above questions, offering a perspective on what is needed when it comes to the use of ICTs support in the judiciary in developing countries.

8.5. **Women’s MDG Portal: Using the Internet to Promote Gender and Social Transformation**

8.5.1. **Aims of the project**

Although no studies document the extent to which the UN Millennium Development Goals are known to the public in developing countries, a survey conducted for the European Commission found that 88 percent of respondents in 25 European countries had never heard of the MDGs. In addition, an OECD study concluded that, despite high-level discussions, “debate and awareness about the MDGs has not trickled down to public opinion…without the pressure which comes from public accountability, these commitments are less likely to be achieved.” Given that this is the situation in the European countries, it does not take much imagination to conclude that the MDGs are little known to the general public living in poverty in developing world – the very people whose lives the MDGs are meant to transform. Indeed, whereas the issue in Europe is the pressure which comes from public accountability, knowledge of the MDGs and how they can be achieved is a central requirement for the world’s poorest simply because they are the grassroots implementers and eventual beneficiaries of achieving the goals.

The eight MDGs, eradicating extreme hunger and poverty, achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, improving maternal health, combating HIV/AIDS, malaria and other diseases, ensuring environmental sustainability, and developing a global partnership for development, form a blueprint agreed to by all the world’s countries and all the world’s leading development institutions almost seven years ago. There are about another seven years to meet the goals in 2015. It is imperative that to enhance the probability of success of the MDGs urgent measures need to be put in place not just to disseminate information on the goals, but also to empower those to whom the goals promise social transformation, with enough capacity to play a role in achieving the goals.

One key orientation of the goals is towards a gender theme. A number of the goals are specifically addressed to women, while the others have the active participation of women in their achievement as a central requirement. It is therefore important that special measures be undertaken to disseminate information specific to women, informing them about the MDGs and empowering them with the knowledge and tools to transform society, the welfare of their families, and their own lives. This is a task in which the new Information and Communication Technologies (ICTs) can be utilized. In particular, the Internet provides a centralized platform from which such information can be networked, standardized and shared. It also provides an opportunity for individuals and groups to participate in creating input into the processes necessary to meet the goals.

WITFOR is considering a proposal for UN MDG Gender Portal Project. The ultimate objective of the project is to create an appropriate, easy to learn and use central information resource, available to all women especially those on the lowest rungs of society, through accessible technologies. The information resource, in the form of a portal should be developed by women, initially students in secondary schools and universities. It should have the capacity to be a learning tool using accessible technologies such as those available at tele-centres and also newer technologies like mobile telephony. The information resource should enable women and women’s groupings to interact and learn from each other’s best practices, and also to benchmark and monitor general and specific progress towards achieving the goals. In the process, the project will have the secondary objective of capacity-building for women in the use of ICT tools.

8.5.2. Specific questions dealt with in the MDG Gender Portal project

The Commission on Ethical, Social and Legal Aspects aims to address the following specific objectives:

- Can we empower women, both as individuals and groups, the capacity to confidently use the new ICT tools such as the Internet in their daily lives?
- Can we create a ready source of gender-oriented information on what requires to be done and how women and women’s groups can participate, in activities that systematically lead to the attainment of the MDGs.
- Can we create the capacity for women and women’s groups to interact and network with colleagues and peers from across the globe, sharing best practices
- Can we create an outlet for experts to interact with and contribute to the contributions of women and women’s groups
Can we create a mechanism for governments, International Organizations, NGOs, Development partners and other organizations to interact with women and women’s groups in a systematic manner.

Can we create a mechanism to monitor and evaluate progress of the MDGs at macro and micro levels.

Can we at the end of the day say that women at the lowest rungs of the social ladder are aware of the MDGs and what they can do to achieve the same?

At WITFOR 2007 the concept and rationale, as well as a prototype demonstration of this project will be made for consideration.

8.5.3. **Background**

The eight MDGs were unanimously adopted by the UN General Assembly in September 2000. The MDGs aim for the commitment of the international community to an expanded vision of development, one that vigorously promotes human development as the key to sustaining social and economic progress in all countries, and recognizes the importance of creating a global partnership for development. The goals have been commonly accepted as a framework for measuring development progress.

The idea of creating an MDG Gender Portal arises from the fact that almost seven years after their adoption, the MDGs are largely unknown by the target population whose lives they seek to transform, and that further, there has not been much effort in empowering target groups to participate in attaining the goals. It is also important to strengthen monitoring and evaluation efforts to ensure that the goals actually achieve what they are meant to achieve.

8.6. **E-learning tools for lawyers and judges**

8.6.1. **Aims of the project**

Teaching and learning by means of ICT-platforms enhances the opportunity of students in developing countries to learn about legal, social and ethical aspects of our present-day society. The development of such platforms and tools is essential because in most developing countries there is currently a lack of skilled personnel to provide such teaching. Moreover, education is often beyond the financial reach of most developing country citizens. The development of e-learning tools realises that students no longer have to travel to an educational institution to learn about certain subjects. Also, by means of ICT-platforms the knowledge is available at any time and any
place. Thus, such tools may add variety and flexibility to student study in developing countries.

Given the above, the Commission on Ethical, Social and Legal Aspects initiated with the University of Addis Ababa a project to contribute to the education on social, legal or ethical aspects of ICT. It aims to provide advanced technological support for distance learning in the legal domain. Given its key importance for determining the national level of economic, technological and social development of developing countries, intellectual property rights is chosen to be the first subject for such an e-learning module. A second module will be focusing on labour law. Over time other themes may be added, also in domain outside the law (ethics and social sciences). At the WITFOR 2007 one of the participants in the project, dr. Rahel Bekele gave a presentation on the project. Dr. Bekele is currently assistant professor and chairperson of the Department of Library Science at the School of Information Studies for Africa (Addis Ababa, Ethiopia).

8.6.2. Specific questions dealt with in the project

Given the afore-mentioned central question of this project, the Commission on Ethical, Social and Legal Aspects has formulated the following ambitions to be realized:

- Identify any existing modules to enable us to learn from them (e.g. the WIPO academy) identify possible on-line hosting options for the module;
- Based on the outcomes of the above, initiate the development of e-learning modules for the legal domain (in the beginning focused for use by lawyers and judges, in later stage students). The first modules will deal with 1) intellectual property rights and 2) labour law.

8.6.3. Background

As a first subject for the e-learning module, intellectual property rights regimes have been chosen. It is widely accepted that the present uniform global intellectual property (IP) system, characterised by requiring a high level of protection, is inherently unjust for developing countries and affects countries in different ways depending upon their level of technological and economic development. Access to and knowledge of new medicines is an illustrative example in this respect. In order to adequately work with and possibly change the current international IP framework as well as recognise its consequences for developing countries, people (students, lawyers, policy makers, etc.) in developing countries need to be aware of the IP protection
framework and the specific implications for their own country. In order to assist these persons in learning about global IP-regimes, their implications at the national level of developing countries as well as regulatory instruments (legislation, licensing contracts, etc.) to implement the relevant legal requirements set in the regimes, we aim to make use of ICTs for teaching and learning about these issues.

8.7. References

- Koops, B.J. & Ronald Leenes (2006), ‘ID Theft, ID Fraud and/or ID-related Crime: Definitions Matter.’ *Datenschutz und Datensicherheit*
• Pontell, H. (2002). “‘Pleased to Meet You...Won’t You Guess My Name?’ Reducing Identity Fraud in the Australian Tax System.” Paper presented at the Centre for Tax Integrity, the Australian National University on October 29, 2002.
Annex 1. Millennium Development Goals

For the purpose of quick reference this annex contains brief information about the Millennium Development Goals (MDGs) and the World Summit on the Information Society (WSIS). The information is derived from the following official websites where much more up to date information can be obtained.

http://www.un.org/millennium/declaration/ares552e.htm

http://www.un.org/millenniumgoals

http://www.itu.int/wsis/index.html

What are the Millennium Development Goals?
The eight Millennium Development Goals (MDGs) – which range from halving extreme poverty to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015 – form a blueprint agreed to by all the world’s countries and all the world’s leading development institutions. They have galvanized unprecedented efforts to meet the needs of the world’s poorest.

Goal 1. Eradicate Extreme Poverty and Hunger

Target 1. Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day.

Progress indicators:
1. Proportion of population below $1 (1993 PPP) per day (World Bank);
2. Poverty gap ratio [incidence x depth of poverty] (World Bank);

Target 2. Halve, between 1990 and 2015, the proportion of people who suffer from hunger.

Progress indicators:
4. Prevalence of underweight children under five years of age (UNICEF-WHO);
5. Proportion of population below minimum level of dietary energy consumption (FAO).
Goal 2.  Achieve Universal Primary Education

Target 3.  Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.

Progress indicators:
6. Net enrolment ratio in primary education (UNESCO);
7. Proportion of pupils starting grade 1 who reach grade 5 (UNESCO);

Goal 3.  Promote Gender Equality and Empower Women

Target 4.  Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015.

Progress indicators:
9. Ratio of girls to boys in primary, secondary and tertiary education (UNESCO);
10. Ratio of literate women to men, 15-24 years old (UNESCO);
11. Share of women in wage employment in the non-agricultural sector (ILO);
12. Proportion of seats held by women in national parliament (IPU).

Goal 4.  Reduce Child Mortality

Target 5.  Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.

Progress indicators:
13. Under-five mortality rate (UNICEF-WHO);
14. Infant mortality rate (UNICEF-WHO);
15. Proportion of 1 year-old children immunized against measles (UNICEF-WHO).

Goal 5.  Improve Maternal Health
Target 6. Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio.

Progress indicators:
16. Maternal mortality ratio (UNICEF-WHO);
17. Proportion of births attended by skilled health personnel (UNICEF-WHO).

Goal 6. Combat HIV/AIDS, Malaria and Other Diseases

Target 7. Have halted by 2015 and begun to reverse the spread of HIV/AIDS.

Progress indicators:
18. HIV prevalence among pregnant women aged 15-24 years (UNAIDS-WHO-UNICEF);
19. Condom use rate of the contraceptive prevalence rate (UNAIDS-WHO);
19a. Condom use at last high-risk sex (UNICEF-WHO);
19b. Percentage of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS (UNICEF-WHO);
19c. Contraceptive prevalence rate (UN Population Division);
20. Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years (UNICEF-UNAIDS-WHO).

Target 8. Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

Progress indicators:
21. Prevalence and death rates associated with malaria (WHO);
22. Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures (UNICEF-WHO);
23. Prevalence and death rates associated with tuberculosis (WHO);
24. Proportion of tuberculosis cases detected and cured under DOTS (internationally recommended TB control strategy) (WHO).

Goal 7. Ensure Environmental Sustainability

Target 9. Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources.

Progress indicators:
25. Proportion of land area covered by forest (FAO);
26. Ratio of area protected to maintain biological diversity to surface area (UNEP-WCMC);
27. Energy use (kg oil equivalent) per $1 GDP (PPP) (IEA, World Bank);
28. Carbon dioxide emissions per capita (UNFCCC, UNSD) and consumption of ozone-depleting CFCs (ODP tons) (UNEP-Ozone Secretariat);
29. Proportion of population using solid fuels (WHO).

**Target 10.** Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.

Progress indicators:
30. Proportion of population with sustainable access to an improved water source, urban and rural (UNICEF-WHO);
31. Proportion of population with access to improved sanitation, urban and rural (UNICEF-WHO).

**Target 11.** Have achieved by 2020 a significant improvement in the lives of at least 100 million slum dwellers.

Progress indicators:
32. Proportion of households with access to secure tenure (UN-HABITAT).

**Goal 8. Develop a Global Partnership for Development**

**Target 12.** Develop further an open, rule-based, predictable, nondiscriminatory trading and financial system (includes a commitment to good governance, development, and poverty reduction; both nationally and internationally).

**Target 13.** Address the special needs of the Least Developed Countries (includes tariff- and quota-free access for Least Developed Countries’ exports, enhanced program of debt relief for heavily indebted poor countries [HIPC’s] and cancellation of official bilateral debt, and more generous official development assistance for countries committed to poverty reduction).

**Target 14.** Address the special needs of landlocked developing countries and small island developing states (through the Program of Action for the Sustainable Development of Small Island Developing States and 22nd General Assembly provisions).
Target 15. Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term.

Progress indicators:

**Official Development Assistance (ODA)**

33. Net ODA, total and to LDCs, as percentage of OECD/Development Assistance Committee (DAC) donors' gross national income (GNI)(OECD);
34. Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) (OECD);
35. Proportion of bilateral ODA of OECD/DAC donors that is untied (OECD);
36. ODA received in landlocked developing countries as a proportion of their GNIs (OECD);
37. ODA received in small island developing States as proportion of their GNIs (OECD);

**Market Access**

38. Proportion of total developed country imports (by value and excluding arms) from developing countries and from LDCs, admitted free of duty (UNCTAD, WTO, WB);
39. Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries (UNCTAD, WTO, WB);
40. Agricultural support estimate for OECD countries as percentage of their GDP (OECD);
41. Proportion of ODA provided to help build trade capacity (OECD, WTO)

Debt sustainability;

42. Total number of countries that have reached their Heavily Indebted Poor Countries Initiative (HIPC) decision points and number that have reached their HIPC completion points (cumulative) (IMF - World Bank);
43. Debt relief committed under HIPC initiative (IMF-World Bank);
44. Debt service as a percentage of exports of goods and services (IMF-World Bank).

Some of the indicators listed below are monitored separately for the least developed countries, Africa, landlocked developing countries, and small island developing states.

Target 16. In cooperation with developing countries, develop and implement strategies for decent and productive work for youth.

Progress indicators:
45. Unemployment rate of young people aged 15-24 years, each sex and total (ILO).

Target 17. In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.

Progress indicators:
46. Proportion of population with access to affordable essential drugs on a sustainable basis (WHO).

Target 18. In cooperation with the private sector, make available the benefits of new technologies, especially information and communications technologies.

Progress indicators:
47. Telephone lines and cellular subscribers per 100 population (ITU);
48. Personal computers in use per 100 population and Internet users per 100 population (ITU).

**What is the World Summit on the Information Society?**

The World Summit on the Information Society (WSIS) was held in two phases: in Geneva, 10-12 December 2003 and in Tunis, 16-18 November 2005.

This Summit represents a milestone, not only for the United Nations and the International Telecommunication Union, which played the leading managerial role in the Summit, but for all stakeholders involved. WSIS is a bold attempt to address the issues raised by information and communication technologies (ICTs) through a structured and inclusive approach.

Our society is changing radically as ICTs become a bigger part of our lives. It is changing in ways unimaginable at the time when the Summit was first proposed by Tunisia at the 1998 ITU Plenipotentiary Conference. Since then the Internet has increased in size ten-fold, while the number of mobile phone users has now grown to over two billion.

The Summit has achieved a common understanding of the key principles that will determine our ability to harness the potential of ICTs. In Geneva in 2003, world leaders shared the vision of a people-centred, development-oriented and inclusive Information Society in their Declaration of Principles, and committed to the Plan of Action setting out targets to be achieved from
2003. More than 2500 projects have been launched in the framework of the Summit, and these are recorded in the WSIS Stocktaking database and report, which will continue to be maintained by ITU. In 2005, governments reaffirmed their dedication to the foundations of the Information Society in the Tunis Commitment and outlined the basis for implementation and follow-up in the Tunis Agenda for the Information Society. In particular, the Tunis Agenda addresses the issues of financing of ICTs for development and Internet governance that could not be resolved in the first phase. On Internet governance, the Tunis Agenda foresees the creation of a new Internet Governance Forum, which will carry the work forward.
Annex 2. Vilnius Declaration

WITFOR 2003 in Vilnius, Lithuania, resulted in the Vilnius Declaration.

**VILNIUS DECLARATION**

We, the participants from 68 countries at The First World Information Technology Forum (WITFOR), organised by IFIP under the auspices of UNESCO and hosted by the Government of Lithuania, gathered in Vilnius, Lithuania, 27-29 August 2003, address through the Forum the following major goals:

- **Bridging** the digital divide between rich and poor in the world; urban and rural societies; men and women; and different generations
- **Ensuring** the freedom of expression enshrined in Article 19 of the universal declaration of human rights and other such instruments
- **Reducing** poverty through the use of education and Information and Communications Technology (ICT)
- **Facilitating** the social integration of excluded segments of societies
- **Respecting** linguistic and cultural diversity
- **Fostering** the creation of public domains with full respect of intellectual property rights
- **Supporting** communities in fighting illiteracy
- **Encouraging** e-governance and e-democracy initiatives
- **Improving** the quality of life through effective health service systems
- **Protecting** the local and global environment for future generations.

We, the participants,

- **Aware** of the complexity facing national governments in developing reliable and affordable ICT
- **Further aware** of the importance and need of safe and secure ICTs as the foundation of global, regional and local Information and Communication services supporting governments, organizations, enterprises and individuals
- **Convinced** that governments need to build upon ICT-related achievements and independently evaluate existing pilot projects from the perspective of beneficiaries
- **Subscribing** to the importance of safeguarding the economic, social, environmental and cultural rights of all peoples, with special attention to the protection of traditional societies and indigenous people
Believing in the equitable and ethical sharing of the benefits of ICT and the minimization of any negative impacts

Fully accepting the realities facing often demanding partners, especially in the sector of economic investment required to set up the physical infrastructure

Conscious that most of the discussions on the future of the information society is being driven by technology push more than by citizens’ needs

call upon national governments, civil societies and other partners to commit themselves to the implementation of the above stated objectives and to translate their commitment to the development of ICT through the creation of a favourable environment for partnership and economic investment. We resolve to work closely with all the above-mentioned partners and commit ourselves to the following strategic actions:

Inviting national governments to give priorities to national socio-economic development plans for the creation of ICT infrastructures through

- International co-operation among central governments and through international development agencies
- The establishment of public and private partnerships as the cornerstone of the deployment of ICT at the local and national levels
- Facilitating investments in the physical infrastructure by international and regional financial institutions
- Supporting the development of new ICT tools and contributing to international programs for ICT advancement
- Ensuring affordable and equitable accessibility to ICT between urban and rural communities and between men and women, taking into consideration the existing generation gap.

Urging national governments to guarantee the application of the principles of freedom of expression and privacy through appropriate legislation that will

- Implement these principles as they apply to traditional media, also to the Internet, and satellite broadcast
- Promote public access to data and information of public interest which is held by governments, private organizations or companies.

Ensuring a continuous process of education on the rights of citizens as a fundamental element of poverty alleviation by
Facilitating affordable universal access to the Internet and encouraging networking and dialogue between the diverse communities of interest

- **Facilitating** knowledge and information sharing (especially as it affects the rights of the poor and the excluded) and facilitating their progressive integration into the fabric of cities, towns and societies to reduce existing social tensions and conflicts

- **Encouraging** international cooperation for the provision of safe and secure information and communication networks and systems

- **Supporting** the development and adoption of Free and Open Source solutions wherever it is more affordable and/or suitable than proprietary solutions

- **Promoting** a harmonious society within the cultural diversity of countries, convinced that national languages must never be seen as an obstacle to access to ICT

- **Facilitating** an environment and a physical and legal infrastructure for the establishment of public domains where
  - Universal access to content is guaranteed as an essential part of the freedom of expression with due respect to legislation governing the rights to intellectual property

- **Empowering** all communities, especially grass roots communities, through systematic programs aimed at developing literacy, including ICT literacy, which progressively involve community members in cooperative actions

- **Encouraging** the use of new ICT tools, especially with regard to the new development paradigm in e-governance and e-democracy
  - Giving due regard to social and ethical aspects and the special needs of different groups in society
  - Empowering them to benefit from the digital revolution

- **Promoting** the use of ICTs to address the basic needs of communities, particularly by creating a modern social health system that would improve their quality of life with special emphasis on
Targeting major health problems in developing countries notably HIV/AIDS, TB, Malaria and mother and child health care, through effective health management information systems

Optimizing the use of free and open source software, models and component specifications in future health information systems

Intensifying training and education in local adaptation, maintenance and use of health related information systems

- Improving the use and application of ICTs in projects aimed at protecting the local and global environment for future generations, and in developing systems for monitoring potentially environment-threatening process and systems that will ensure a continued healthy environment.

We, the participants, representing national governments, business communities, NGOs, IGOs, academia and international organisations invite all partners to translate the above strategic actions into implementable action plans. We call upon all national, regional and international financial institutions to be involved in the implementation of these action plans by investing in the necessary development of ICTs at local, regional and national levels.

The Forum conducted its work through 8 commissions. These commissions stated the following:

**Commission 1. Preparing the ground for ICT**

Availability and use of ICTs across a spectrum of public and business domains is rightly highlighted as a crucial area of government action for development. To date, however, there has been a depressingly low rate of success in such efforts, largely due to an overly technocratic approach to the problem. ICT policies for the diffusion of technology must be made in the context of development priorities and be accompanied by actions to create socio-economic conditions that enable local communities to appropriate ICTs for the improvement of their lives. To prepare for ICT and successful participation in the Information Society, there needs to be sustained government action in understanding and responding social demand, reshaping national education, building indigenous science / technology / engineering capabilities, and effecting economic and social reform.

**Understanding and responding to social demand** includes: creating awareness regarding opportunities offered by ICT for socio-economic change, as well as the effort involved in such change; use of ICT in
government organisations; interventions to empower socially excluded groups.

**Reshaping national education** includes tackling illiteracy; development of computer and information skills; professional engineering and management capabilities; development of critical abilities.

**Building indigenous science/technology/engineering** capabilities includes cultivating a socio-economic context of innovation; tertiary education curricula for engineering and management; local R&D balancing export opportunities and local needs, international R&D.

**Effecting economic and social reform** measures for appropriate economic liberalization and the development of an effective market socio-economic regime; support of entrepreneurial activities, social policies to alleviate the destructive effects of socioeconomic innovation; legal framework for the information economy; political mechanisms enabling citizens to participate in local and global socio-economic change and negotiate their preferred life conditions.

**Commission 2. Building the infrastructure**

There are three themes for ICT development:

1. Connectivity referred to communications infrastructure;
2. Capacity to make effective use of ICTs;
3. Content of information and knowledge stored on and transmitted by the ICT networks.

Infrastructure should not be considered as only equipments, but it should be understood as: Technology, Services, Human resources, Legal and regulatory framework and Economy. Some recommended actions for building a sustainable ICT infrastructure follows.

1. Adherence to International standards should be encouraged and when appropriate enforced.
2. Operation and maintenance should be considered from the very beginning of any ICT project to ensure project success and sustainability. “Do not invest in what you cannot maintain”.
3. Promotion of universal Internet access should be supported to minimize the risk of widening the digital divide.
4. Implementation of new ICT services should be encouraged.
5. On-going education at three different levels: executive awareness level, user skills level and professional technical level.
6. Governments should formulate a long-term vision, set policies, regulate, protect the users and control the quality of services.
7. Regulatory authorities should be in charge of a comprehensive regulatory framework to enforce efficiency, competition, transparency and universal access.
Commission 3. Economic opportunities

Developed and developing countries are divided by a multitude of economic, social, cultural and other issues, but arguably the most significant divide at present is digital. Combined with globalization of trade, new digital technologies are presenting economic opportunities and creating wealth at a rate that threatens to increase the divide. The level of developing countries’ involvement use of ICT slowly improves but many countries are unable to make real progress in economic development without assistance. A comprehensive set of national policies and strategies prepared by WITFOR’s Economic Opportunity Commission provides clear paths to bridge the digital divide. Timing is a key factor. If developing countries are delayed in their digital development then the rapid growth of the developed world may leave them impossibly far behind.

Commission 4. Empowerment and participation

With ICT governments is able to improve the quality and expand the reach and accessibility of the services they offer to their citizens. In that way good governance is the goal and e-Government is the way. Building up modern governance in the information society has to go in such directions as citizen-centred, cooperative, seamless, polycentric.

There are four postulates that have to be stated for achieving good practice (according to the 2003 eEurope Awards Conference):

- e-Government is the key to good governance in the information society.
- e-Government is impossible without having a vision.
- e-Government is not just about technology but a change in culture.
- e-Government is not just about service delivery but a way of life.

Up to now low take up of public e-services is a big problem. For improving some requests have to be met:

- Services must become less bureaucratic and citizens have to get economic and individual benefits.
- The needs of specific target groups must be addressed.
- A multi-channel access mix is necessary with a diversity of contact points: home and mobile, kiosk, citizen office and multifunctional service shops.
- A single-window access for all services regardless of government level and agency.
- Interweaving knowledge enhancement into service processes.
- Special promotions concentrate on individual groups of addressees: rural and traditionally underserved communities, the younger.
Democratic decision-making has to stress citizen participation. For this the interaction between individuals and organizations has to be sustained by electronic services.

**Commission 5. Health**

IT strategies in health care should target the major health problems in developing countries, such as HIV/AIDS, TB, Malaria and mother and child health. Therefore:

Developing countries should prioritise **Health Management Information Systems**, using multiple sources of aggregated and anonymised data from different related sectors in society, aiming at strengthening health management and primary health care delivery including a basic hospital structure. **Integration** within and between health care establishments requires the specification of data sets and terminology to be consistent.

Future health information systems should optimally use **Free and Open Source Software**, models and component specifications characterised by:
- Scalability and flexibility through a component-based architecture enabling free combination of relevant services allowing for incremental development;
- Portability separating logical and technological specifications;
- Fine-grained architecture to reduce complexity.

**Sustainable** systems must be based on: training and institutional development enabling local adaptation, maintenance and use; leadership of health professionals and other domain experts in systems development; focus on local use of information for action.

**Commission 6. Education**

1. **Nature of education**: The nature of education is to improve a person's relation to the world. The organization, methods, structures and objectives of education should be brought into alignment with the knowledge society.

2. **Lifelong learning**: ICT can allow education to be spread around many communities, and promote lifelong learning and capacity building for the whole community.

3. **E-inclusion**: ICT should be used to reduce the education inequalities. Women, unemployed and disadvantaged people (refugees, disabled, etc.) should receive special attention on this process. National contents must be developed in local languages.

4. **Computer literacy**: At all levels of education, computer literacy and ICT competence for knowledge society should be achieved, adapted to local conditions.
5. **Teacher education**: Any educational system reform should start with teacher inservice and pre-service education. Teachers should be encouraged to acquire and use ICT equipment and skills.

**Commission 7. Environment**

1. **Needs identification and capacity building**:
   i) Identification of special needs of Least Developed Countries (LDCs) and indigenous people, safeguarding of their local culture.
   ii) Capacity building efforts leading to self-sufficiency in all aspects of training and supporting programs and technologies in ICT for the environment.

2. **Public policy and access**:
   i) Development and implementation of equitable strategies for ICT including access to affordable systems and connectivity.
   ii) Decreasing non-tariff barriers on ICT and environment.
   iii) Promotion and establishment of policy alternatives that provide for equitable growth and development.
   iv) Promotion and establishment of policies that promote the links between environmental knowledge, data and quality and human health, environmental degradation, natural disasters, climate change, food security, water supply and quality, and other related issues.
   v) Improvement of public accessibility and understanding of ICT and environmental issues. This includes the roles of public data access and data sharing between organizations, regions and countries.

3. **Monitoring and regulatory issues**
   i) Identification, development and promotion of the role of ICT in environmental monitoring processes and the regulation of environmental issues. This includes local or regional monitoring for regulatory processes and monitoring as part of regional or global networks (for example, global climate change monitoring networks).
   ii) Establishment of networks for monitoring that provide equitable access to facilities, equipment, training and communications so that there is both data sharing and technology transfer.

**Commission 8. Social and ethical aspects of the information society**

Most of the discussions on the future of the information society suggest that it is being determined by technical feasibility and driven by technology push more than by users’ and customers’ needs. Little attention is paid to social impact and ethics – except in the field of education and culture.
Among the social and ethical concerns we strongly suggest a focus on professional ethics; access to content and technology for all; education, literacy and public awareness; multilingualism, cultural concerns; influence of globalization; regulation, self-regulation, governance and democratic participation; intellectual property rights; specific digital policies such as eHealth, eWork, eGovernment …; privacy; protection of human and civil rights; protection of the individual against surveillance; develop quality of life and well-being; combating social exclusion; computer crime, cyber-attacks and security; employment and participative design at work; risk and vulnerabilities.

WITFOR Commission 8 on Social and Ethical Aspects of the Information Society recommends establishing national or regional social and ethical committees to assess these issues and develop social and ethical benchmarks, to ensure that the balance between technical and social aspects is maintained. If we are to enter an information and knowledge society we must remain critical and human.
Annex 3. Gaborone Declaration

WITFOR 2005 in Gaborone, Botswana, resulted in the Gaborone Declaration.

GABORONE DECLARATION

We, the participants at The Second World Information Technology Forum (WITFOR 2005), organised by International Federation for Information Processing (IFIP) under the auspices of UNESCO and hosted by the Government of Botswana, gathered in Gaborone, Botswana, 31 August – 2 September 2005, focused on the crucial role of ICT in accelerating development. We reaffirm our commitment to the following major goals, guided by the Millennium Declaration and the WSIS Plan of Action:

- Contributing to the eradication of poverty through the appropriate use of ICT;
- Bridging the multiple digital divides of contemporary society;
- Addressing the need for creative capacity-building strategies towards ICT innovation;
- Encouraging diverse partnerships and promoting collaborative networks.

We, the participants at WITFOR 2005, building on the experience of WITFOR 2003, and

- Aware of the complexity facing national governments in translating ICT policies and plans into action;
- Acknowledging constraints of developing countries to acquire and utilize ICT technology resources;
- Recognising the value of demonstrating the potential of ICT through real life examples;
- Subscribing to the importance of education, research and cooperation to build a body of knowledge on the use of ICT for development;
- Conscious to the importance of ensuring that ICT-related interventions respect economic, social, environmental and cultural rights of all people, with special attention to traditional values of societies and indigenous people;
- Believing in equitable and ethical sharing of the benefits of ICT and the minimization of any negative impacts;
- Fully accepting challenges of financing ICT infrastructure.
We therefore resolve to focus mainly, though not exclusively, on eight thematic concerns:

- **Building Infrastructure**: Supporting research, development and economic analysis for enhanced ICT infrastructure in underserved areas;
- **Economic Opportunity**: Exploring appropriate scalable, replicable ebusiness models that promote sustainable development;
- **Environment**: Using and promoting ICT for environmental protection and the sustainable use of natural resources;
- **Health**: Using ICT to improve the efficiency and equity of health service provision;
- **Education**: Promoting innovative and effective methods to exploit ICT to improve teaching, learning and knowledge generation;
- **Agriculture**: Using ICT to improve sustainable agricultural production systems by disseminating knowledge and information, particularly to rural communities;
- **Social, Ethical and Legal Aspects**: Promoting socially responsible and ethical use of ICT and taking appropriate legal measures;
- **Empowerment and Participation**: Encouraging universal access strategies, e-government and e-democracy to enable participation in the information society.

We recommend that action is taken on each of these areas and that sustainable projects are implemented such as those indicated in the *Proposed Projects & Actions* that illustrate applications of ICT to diverse social and development challenges. We further invite national governments, parliamentarians, local authorities, civil society, the business communities and academia to support such initiatives through regional, international and cross-sectoral collaborative networks.

**PROPOSED PROJECTS & ACTIONS**

This list of proposed projects & actions resulted from the work of the eight Commissions. The list is neither exhaustive nor prioritised, and is meant to be only indicative of relevant action. Further details on these project proposals and useful links can be found on [www.witfor.org.bw](http://www.witfor.org.bw). It is expected that this list will grow over time with other relevant project ideas and examples from around the world that fall within the scope of the objectives of WITFOR.

1. **INFRASTRUCTURE**

   **Supporting an enabling and competitive environment for the necessary investment in ICT infrastructure**
We propose the implementation of delivering value added digital services at places which do not have online Internet connectivity. Digital data, such as letters, audio, pictures, applications, e-Governance applications such as issue of birth and death certificates, land records, consultation with doctors/agricultural officers on health, crops diseases and other farming related information, astrology and complaint registration are some of the applications for which such a service can be used by rural people.

GramPatra is a product of Media Lab Asia for delivery of value added digital services at places which do not have online Internet connectivity. This project specifically addresses the quest for the last mile infrastructure in developing countries. An email interface without towers and transmissions cables has been developed which is the backbone of GramPatra for development of various applications appropriate for rural areas. Presently there is poor Internet coverage in many countries of the developing and under-developed world and hence there is poor availability of appropriate digital information access and exchange. GramPatra presents an intermediate solution for digital information access and exchange before online Internet becomes available in specific geographical locations and a step towards meeting the Universal Service Obligation for digital information access.

We further propose a research project to raise interest in Digital PowerLine technology with a view on initiating research into the use and applicability of powerline technology in developing countries to provide the last mile infrastructure. Digital PowerLine technology is an exciting alternative to connecting to the Internet via phone and modem. Though this technology is not commercially available yet, it should be available before other broadband technologies due to the relatively low cost of its local loop. Moreover, its high speeds will provide Internet access, video on demand, local phone, and long distance phone services to customers.

2. ECONOMIC OPPORTUNITY
Promoting the use of e-business models to stimulate the investment of the private sector and support of governments for small and medium enterprises

We propose the creation of electronic trading hubs to enable rural communities to efficiently trade with larger consumers in the urban areas. The electronic trading hub (e-trading hub) would enable retailers in urban areas to place information regarding demand and the prices they are willing to pay for the day. The rural communities would access this information and know when, where and how much to supply. Suppliers could also place
information on their products and how much they can supply so that consumers can know what is available. The rural communities would be able to access this information via mobile phones and via the Internet through their own Internet facilities at community access centres.

We further propose to create electronic market places (e-market places) for community based tourism projects in order to enable them to access new markets for their uniquely packaged products. The assumption is that such community based tourism projects already exist, albeit in their own unique forms that are mainly understood and accessible locally. Our aim is to create e-market places for the projects.

Linked to these projects will be a research process based on the premise that the nature of the projects must be multi-disciplinary where information, information technology and the integration thereof within the communities must be researched to benefit the communities in total. The following research questions will be addressed:

- In what way and form will a rural-urban e-trading hub facilitate the generation and enhancement of economic opportunities in rural communities?
- In what way and form will e-market places generate and enhance economic opportunities for community based tourism in rural communities?

3. ENVIRONMENT

Using and promoting ICT as an instrument for environmental protection and the sustainable use of natural resources

Currently there is insufficient capacity world-wide to implement effective crossboundary, interoperable environmental and risk management applications. Some areas, for example Europe, are currently making a significant investment in building such capacity.

We propose creating a project-based collaboration between developing and developed countries to be based on two major activities: a capacity-building activity and a research activity, focused on environmental information infrastructures.

The capacity-building activity would enable developing countries to use ICT better in environmental applications. It would be based on joint conferences, seminars and short courses.

The research activity would lead to implementation of a large-scale environmental information network, initially in southern Africa, based on
existing and emerging standards. This activity would be strongly related to regional and global initiatives and would be the seed for participation by Africa and other parts of the developing world in world-wide information infrastructures.

The outcome of the proposed activities would improve interoperability between countries’ information systems and create a universal framework for environmental decision-making.

4. HEALTH
Using ICT to improve the efficiency and equity of health service provision.

We propose to strengthen health information systems within the developing world by building collaborative networks to share experiences, practices, knowledge and products amongst the developing countries themselves as well as the developed countries. We further propose to promote open standards and to undertake research on information systems and application of Open and or Free Software and proprietary software in the health sector. Furthermore we propose to improve communication among health workers by providing health workers with e-mail and Internet connectivity.

As an example, already before WITFOR 2005 the European Commission’s 6th Framework Program’s Information Society Technologies (IST) program decided to fund the implementation of the BEANISH project (Building Europe Africa collaborative Network for applying IST in the Health Care Sector). The overall goal of BEANISH is to build networks of research and development between and within countries in Africa and Europe on practical applications of ICT in the health sector.

The concrete objectives are linked to:
• Strengthening Health Information Systems in Africa;
• Collaborative development and application of Free and Open Source Software for Health;
• Sharing “best practices” and capacity across countries.

Linked to this project as part of BEANISH is a research and capacity building project. This aims at creating a research network around globally distributed collaborative, especially open source application software development. A proposal is being made on Extending BEANISH to Asia (E-BEANISH), to build collaborative networks of networks.
5. EDUCATION

Developing ICT-enhanced education to achieve “Education for All” targets

We recognize the acute shortage in developing countries of qualified teachers, and propose to use ICT and innovative methods for accelerating and improving teacher education and competence of practicing teachers. We propose to use innovative ways of ensuring provision of ICT facilities to students and educational institutions in developing countries, especially those in remote areas.

We recommend the sharing of best practices and experiences, as well as collaboration and partnerships, both north-south and south-south, in the use of ICT in promoting education.

We recommend the dissemination and sharing of open educational resources, free technologies and free knowledge. We propose that developing communities be enabled and empowered to drive processes of using and developing free knowledge resources, adapted to local contexts in collaboration with the global community.

We support implementing the proposed SADC-wide professional development project enhancing the integration of ICT to teaching and learning in pedagogically meaningful ways. The project pilot phase starting in Botswana and Mauritius is funded by the Government of Finland and is seeking wider support for full-scale implementation. It aims at creating a model fostering sustainable development and collegial support to innovative learning and knowledge-creating communities of teachers. The project will be comprised of researchers and practitioners belonging to educational institutions and authorities from north and south, and is open to new partners. The objective is to create an organisational structure combining efficiently relevant educational authorities to flexible task forces. It allows researching integration of work, learning and institutional process.

We encourage the dissemination of the Stellenbosch Declaration “ICT in Education; What works?” based on 40 years of experience in IFIP’s Committee on Education.

We further recommend the use of existing initiatives in ICT certification in different areas and levels, e.g. teachers ICT licence, basic ICT user licence, ICT professional licence etc.
6. AGRICULTURE
Using ICT in the dissemination of knowledge and information, particularly to rural communities, to reduce poverty by improving agricultural production and sustainability

We propose a project to enhance the basic knowledge, managerial and financial skills and sustainability of agricultural production systems. Agriculture consists of a variety of diverse sectors, some of which have the potential to contribute substantially to poverty alleviation and the development of sustainable agricultural production systems. There is growing interest in crop production, horticulture and vegetables, aquaculture, rangeland systems and livestock production systems. The success of these depends on the dissemination of basic knowledge and skills to rural farmers and the packaging of information in an acceptable and accessible way.

The agricultural needs depend on the ecological region, the exciting infrastructure, capacity and availability of natural resources and capital. The skills that need to be addressed include a variety of managerial aspects and the creation of financial awareness and implications in order to make farming commercially viable. Although complex models are available to manage intensive agricultural systems, little progress has been made in terms of ICT and modelling of rural or small-scale agricultural systems. The current developments are focussed mainly on livestock production systems since these tend to be more dominant and popular in rural areas.

In this regard we propose to firstly address the managerial and financial skills of traditional livestock farmers with a system based on the principles proposed in the Cattle Farm Management System (CFMS). The great advantage of this approach is that it can easily be adopted as part of the recently introduced Botswana livestock identification and tracking system that was introduced four years ago, which ensures traceability. It is now widely accepted that livestock identification and traceability are essential prerequisites to ensure safe products and reduce the incidence of foodborne diseases. A number of other developing countries have introduced compulsory livestock identification systems, but it is accepted that more can be done to improve the dissemination of information and knowledge as proposed in the CFMS or alternative systems.

We further propose a supporting research project to develop a model that could accurately predict the performance of grazing animal and pasture production under variable rainfall and temperature conditions. Such a model could assist governments with rangeland management, strategies for research
and development and livestock marketing, and would link strongly with the proposed CFMS for traditional livestock farmers.

7. SOCIAL, ETHICAL AND LEGAL ASPECTS
Increasing awareness of the social, ethical and legal dimensions of ICT

We propose the building of a collaborative virtual community to bring together all civil society stakeholders and initiatives in developing countries directed at ICT and socio-economic development. This project will be in pursuit of the MDG to “develop a global partnership for development”. The purpose of the project is, first and foremost, to bring together and facilitate collaboration between grassroots and community based civil society actors and initiatives and then to facilitate collaboration between these local networks and existing global networks.

We further propose the development and implementation of a digital online network and forum for indigenous knowledge. The aim of this project is to create an Internet based digital network for the conservation, development and dissemination of indigenous knowledge. The purpose of the digital network would be to bring together existing digital resources and to implement specific community based projects to record and promote indigenous knowledge (languages, narratives, rituals, artefacts, etc). The project will be community driven and may initially focus on existing resources and on indigenous cultural knowledge that is easy to record and catalogue with minimal technology, such as aboriginal narratives.

We further propose building a regional policy framework and capacity for controlling cyber crime in developing countries. The aim of this project is to study the problem of cybercrime in developing countries (with an initial focus on Africa) and produce resources to deal with it effectively. This will include the development of a policy framework, the harmonization of legal frameworks and the building of capacity in investigating and prosecuting cyber crime. The project will aim to build on existing international treaties and conventions such as the Council of Europe Convention on Cyber Crime.

8. EMPOWERMENT AND PARTICIPATION
Encouraging e-governance and e-democracy initiatives

We propose initiatives focusing on empowerment and participation in line with the objective of utilizing ICT for accelerated development with particular emphasis on the needs of developing countries. Empowering citizens enables them to participate in the information society and acquire knowledge that improves their socioeconomic well being. This objective
becomes concrete in devising appropriate universal access policies and strategies as well as in developing cost-effective community user information systems. E-governance programs contribute to improving the quality and expansion of the reach and accessibility of the services offered to citizens. On a closer inspection e-governance and e-democracy are complementary processes in nature. For all such activities the criteria of sustainability and affordability of systems demand priority and targeting the special requirements of the marginalized groups as the main concern.

The following project themes are being proposed as priority areas for concretizing the empowerment and participation of citizens:

1. Capacity building in public institutions, especially local government institutions, to put in place e-government applications in order to enhance the provision of e-services. The projects would include equipment support and specialized skills training.

2. Scaling-up of community ICT centres based on evaluated and replicable models, with the aim of increasing public access to electronic information.

3. The establishment and/or scale-up of empowerment centres with the goal of enabling youth in disadvantaged circumstances to be absorbed into the mainstream economy or tertiary education system. The projects would focus on out-of-school youth and would provide computer literacy training, career and social guidance. Initially the projects could seek to the extent possible, to use existing facilities, such as schools, community multimedia centres, community telecentres and others. The projects would also explore public-private partnerships.

4. The development and/or adaptation of applications and tools for the creation of locally relevant content, taking into consideration cultural and linguistic diversity. Due cognizance of the major economic activities of the target groups should be considered, such as agriculture, small scale trade, etc.
Annex 4. IFIP WITFOR 2007 program

Introduction
In seven plenary and numerous parallel sessions the eight commissions and the steering committee of WITFOR had put together a broad spectrum of topics, presented by 140 speakers from more than 45 countries from across the continents. This made the convention centre of the UN Economic Commission for Africa a place full of presentations and interactions, not only during the sessions but also during the breaks. To give an impression of the richness, the full program is presented below. Due to the large number of speakers, last minute changes were inevitable and we have made every effort to include all the changes and regret any omission that may have escaped our attention.

General program schedule

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<td>Time / Date</td>
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<td>23 August 2007</td>
<td>24 August 2007</td>
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<tr>
<td>8:30 - 10:15 (Plenary 1 starts at 9.00)</td>
<td>Plenary 1: opening session, keynotes</td>
<td>Plenary 4: invited speakers</td>
<td>Plenary 5: invited speakers / panel</td>
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<td>Theme: <strong>ICT for development and prosperity</strong></td>
<td>Theme: <strong>Best practice country experiences with ICT policies</strong></td>
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<td>10:15 - 10:45</td>
<td>coffee break / exhibition visit</td>
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<td>10:45 - 12:15</td>
<td>Plenary 2: keynotes / invited speakers</td>
<td>Parallel 2: commissions</td>
<td>Plenary 6: invited speakers</td>
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<td>Theme: <strong>The value of major programs</strong></td>
<td>(separate programs of the commissions)</td>
<td>Theme: The role of industry</td>
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<td>14:00 - 15:30</td>
<td>Plenary 3: invited speakers</td>
<td>Parallel 3: commissions</td>
<td>Plenary 7: invited speakers / closing</td>
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<td>Theme: <strong>From WSIS onwards</strong></td>
<td>(separate programs of the commissions)</td>
<td>Theme: The next steps</td>
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<td>16:00 - 17:30</td>
<td>Parallel 1: commissions</td>
<td>Parallel 4: commissions</td>
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Plenary sessions

Wednesday, 22 August 2007, 9:00 - 10:15
Plenary 1: Opening session, keynotes
Theme: ICT for development and prosperity
Session chair: H.E. mr. Tefferra Waluwa, Minister of Capacity Building, Ethiopia
- H.E. mr. Meles Zenawi, Prime Minister of Ethiopia, General Conference Chair of WITFOR 2007, Ethiopia
- mr. Baba Moussa Aboubakari, Director, Infrastructure & Energy, on behalf of H.E. dr. Bernard Zoba, Commissioner for Infrastructure and Energy, African Union
- ms. Aida Opoku-Mensah, Director, ICT and Science & Technology Division (ISTD), on behalf of mr. Abdoulie Janneh, executive secretary UN ECA, Ethiopia
- prof.dr. Klaus Brunnstein, president of IFIP, Germany

Wednesday, 22 August 2007, 10:45 - 12:15
Plenary 2: keynotes / invited speakers
Theme: The value of major programs
Session chair: mr. Satish Jha, Chairman, Digital Partners India / USA
- One Laptop Per Child (OLPC), mr. Nicholas Negroponte, chairman emeritus MIT Media Lab / chairman One Laptop Per Child, USA
- African Development Bank projects, mr. Amadou Thierno Diallo, Manager Energy & ICT Division, Infrastructure Department, African Development Bank, Tunisia

Wednesday, 22 August 2007, 14:00 - 15:30
Plenary 3: invited speakers
Theme: From WSIS onwards
Session chair: ms. Aida Opoku-Mensah, Director, ICT and Science & Technology Division (ISTD), UN ECA, Ethiopia
- UN GAID, mr. Ezani Amir, Advisor to the Executive Coordinator, United Nations Global Alliance for ICT and Development, USA
- ITU, mr. Marcelino Tayob, International Telecommunications Union, Zimbabwe
- IFIP, prof.dr. Sebastiaan von Solms, President-elect of the International Federation for Information Processing, South Africa
• **UN ECA, mr. Makane Faye**, Senior Regional Advisor, ICT, Science and Technology Division, United Nations Economic Commission for Africa, Ethiopia

**Thursday, 23 August 2007, 8:30 - 10:15**

*Plenary 4: invited speakers*

Theme: **Best practice country experiences with ICT policies**

Session chair: **H.E. mr. Teferra Waluwa**, Minister of Capacity Building, Ethiopia

• **H.E. mr. Mubika Mubika**, Deputy Minister of Communication and Transport, Zambia

• **mr. Debretsion Gebre Michael**, Director General, Ethiopian ICT Development Agency (EICTDA), Ethiopia

• **mr. Xiao Hua**, Director General, Ministry of Information Industry, P.R. China, *Creating a better tomorrow of Information Society by making joint effort to narrow the digital divide*

• **dr. Nguyen Ai Viet**, Deputy Director General, Office of the National Steering Committee on Information and Communication Technologies, Vietnam

• **mr. Rogerio Santana**, Secretary for Information and Logistic Technology, Ministry of Planning, Budget and Management, Brazil

• **mr. Mohamed Abida**, Director, Minister’s Cabinet Member, Tunisia, *ICT policy in Tunisia*

• **H.E. mr. Kinichi Komano**, Ambassador of Japan to Ethiopia

**Friday, 24 August 2007, 8:30 - 10:15**

*Plenary 5: invited speakers / panel discussion*

Theme: **Human resource capacity building**

Session chair: **dr. Hyeun-Suk Rhee**, director, Asian and Pacific Training Centre for Information and Communication Technology for Development (APCICT), Korea

• **HRD and development, mr. Ashis Sanyal**, senior director, Department of Information Technology, Ministry of Communications & Information Technology, India

• **IFIP professionalism project, mr. Charles Hughes**, BCS President 2005-2006 and Chair of the IFIP Task Force for the International Professional Practice Program, UK

• **APCICT experiences, dr. Hyeun-Suk Rhee**, director, APCICT, Korea

• **The IICBA approach, dr. Joseph Ngu**, director of UNESCO’s International Institute for Capacity Building in Africa, Ethiopia

• **AWO Digital Content, ms. eng. Suha Osman**, IT Department, Arab Women Organization, Egypt
• **Panel discussion**, moderated by the session chair, panel members are the speakers

**Friday, 24 August 2007, 10:45 - 12:15**  
*Plenary 6: invited speakers*

**Theme:** The role of industry  
**Session chair:** mr. Teshome Beyene, Secretary, Ethiopian Chamber of Commerce

- ZTE, **mr. Qiang Feng**, CTO of South African Region, ZTE Corporation, China  
- Microsoft, **mr. Ali Hoballah**, UPG Manager Middle East & Africa, South Africa  
- Huawei, *Keypoints to the success of bridging the future with ICT*, **mr. Cheng Shangchao**, Deputy CTO South Sahara Region, South Africa

**Friday, 24 August 2007, 14:00 - 15:30**  
*Plenary 7: invited speakers / closing session*

**Theme:** The next steps  
**Session chair:** prof.dr. Klaus Brunnstein, president of IFIP, Germany

- **Keynote:** *Thinking Systemically About HealthCare! What we believe is not always what we see* ...., **mr. Thomas J. Durel**, former CIO/ CSO - Chief Strategy Officer / SVP of BlueCross / BlueShield and CEO of Oceania, USA  
- Summary and conclusions of commissions work and WITFOR 2007, **mr. Leon Strous**, IFIP, WITFOR 2007 Program Chair  
- Closing of WITFOR 2007 on behalf of the general conference chair, H.E. Meles Zenawi, Prime Minister of Ethiopia
Parallel sessions: Commission on Agriculture

Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1
Theme: Creating ICT-enabled knowledge networks around agriculture
Session chair: mr. Vikas Nath, Switzerland
- Global network of agriculture information professionals, mr. Peter Ballantyne, president of the International Association of Agricultural Information Specialists (IAALD), Netherlands
- Regional networking of agricultural projects in Middle East and North Africa, mr. Awni Shdaifat, project manager Yarmouk Agricultural Resources Development Project, Jordan
- Setting up a national-level Solution Exchange for agriculture development practitioners, mr. Steve Glovinsky, Adviser to the UN Agencies represented in India, India

Thursday, 23 August 2007, 10.45-12.15, Parallel 2
Theme: Promoting trade and competitiveness in agriculture using ICTs
Session chair: mr. Peter Ballantyne, Netherlands
- Promoting Agricultural Trade through e-Marketplace for Farmers, mr. Edgardo Herbosa, director, B2BPriceNow.com, Philippines
- Ethiopian Commodity Exchange (ECEX), dr. Eleni Gabre-Madhin, program leader International Food Policy Research Institute, Ethiopia

Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3
Theme: Going beyond - innovative applications of ICTs in agriculture
Session chair: mr. Vikas Nath, Switzerland
- Using ICTs for Managing Genebanks: Experience of SADC Plant Genetic Resources Centre, mr. Barnabas W. Kapange, Senior Program Manager, SADC Plant Genetic Resources Centre, Zambia
- Pest-Incidence Traceability System - Peppers, Ports and Pest tracking, ms. Dionne Clarke-Harris, IPM CRSP Coordinator, Jamaica

Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4
Theme: Transforming farmers at farm-level
Session chair: mr. Peter Ballantyne, Netherlands
- Delivery Agricultural Services to Farmers through Telecottages since 1994: The Hungarian Public-Private Partnership Model, mr. György Nagyhazi, Hungary
- School-on-Air: Lessons from use of Radio Broadcasting for Training of
Farmers in Philippines, mr. Vikas Nath, Founder, DigitalGovernance.org, Geneva, Switzerland

- GIS for Sustainable Forest Resource Management in Ethiopia, mr. Mengistic Kindu, Ethiopian Institute of Agricultural Research (EIAR), Ethiopia

**Parallel sessions: Commission on Building the Infrastructure**

**Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1**
Theme: Case of study
Session chair: prof. Ana Pont Sanjuan, Spain
- WiFi, Roads, VOIP, & Prepaid Cards: Leapfrogging Rural Communications Beyond the Economic Reach of Cellular, dr. Mieso Denko, Guelph University, Canada
- BoonaNet: Integrated SMS & IM Mediated Price Information for Coffee and Crops in Ethiopia, (Ethiopia, USA, and Canada), dr. Samuel Kinde Kassegne, San Diego State University, USA
- E-Infrastructure Support for Rural Small and Micro Enterprises, SME: A Case study of South Africa (South Africa). prof. Matthew O. Adigun, University of Zululand, South Africa
- The Pan African e-Network project, H.E. mr. Gurjit Singh, Ambassador of India in Ethiopia

**Thursday, 23 August 2007, 10.45-12.15, Parallel 2**
Theme: WITFOR Projects
Session chair: prof. Ana Pont Sanjuan, Spain
- The BorgouNET Project, mr. Constant Sossoulo, executive director BorgouNET NGO, Benin (Jointly with Education Comm.)
- Education levels for a correct implementation and use of the infrastructure, dr. Ramon Puigjaner, Universitat de les Illes Balears, Spain
- Low-cost telecommunication systems and information services for rural primary healthcare, mr. Pablo Osuna Garcia, EHAS Foundation, Argentina
- Telecom Infrastructure Overhauling: The case of Ethiopia, mr. Zelalem Bekele, Ethiopian Telecom, Ethiopia

**Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3**
Theme: Guidelines and experiences
Session chair: mr. Hailu Ayele, Addis Ababa University, Ethiopia
• The RURALMAYA project, (Comunidad Valenciana, Spain), dr. Jorge Hortelano, Polytecnic University of Valencia, Spain
• Government ICT Infrastructure, The Ethiopian Case, Mr. Abiyot Bayou and Mr. Tarik Hagos, EICTDA, Ethiopia
• Information and telecommunication Technologies: A strategy to the competitive. The Colombia’s experience, Dr. Yezid Donoso, Universidad del Norte, Barranquilla, Colombia
• University-wide Networking to Support Research and Education: Lessons and Challenges, Mr. Workset Lamene, Addis Ababa University, Ethiopia

Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4
Theme: Papers
Session chair: Mr. Hailu Ayele, Addis Ababa University, Ethiopia
• Research in the area of Wireless Communications Technology, Hailu Ayele, Addis Ababa University, Ethiopia / Increasing Interaction in the Classroom with Mobile Wireless Technology, Tamrat Bayle, College of Telecommunications & Information Technology of ETC, Addis Ababa, Ethiopia
• Flattening The World -The Prospects for Fiber Optic Technology in Africa / Utilizing Very Small Aperture Terminal (VSAT) Technology Infrastructure in African Schools, Mr. Ebenezer Malcalm, Ohio University, USA
• Wireless Sensor Networks in the Context of Developing Countries, Dr. Walttenegus Dargie, Technical University of Dresden, Germany
• Powerline Communication: Untapped Broadband Infrastructure in Developing Countries, Mr. Getahun Mekuria, University of Duisburg-Essen, Germany

Parallel sessions: Commission on Economic Opportunities

Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1
Theme: BPO: Late starters and the BPO market: Emerging Models
Session chair: Satish Jha, Chairman, Digital Partners India / USA
• Mr. Chris Uwaje, Connect Technologies and past president of the Information Technology Association of Nigeria (ITAN), Nigeria
• Prof. Nathan Eagle, MIT, USA / Entrepreneurship programming centre (EPROM), Africa
• Dr. Atanu Dey, chief economist, NetCore Solutions Pvt Ltd, India
Thursday, 23 August 2007, 10.45-12.15, Parallel 2
Theme: Wealth by Collaboration
Session chair: mr. Satish Jha, Chairman, Digital Partners India, New Delhi and Washington, DC, USA
- mr. Michel Bauwens, Foundation for P2P Alternatives, Thailand
- dr. George Sadowsky, Special Adviser to the U.N. Secretary-General's Special Adviser for Internet Governance and consultant with Internews Network, USA
- ms. Monique Morrow, Distinguished Consulting Engineer, CISCO Systems, USA
- dr. Eddan Katz, Director, Access to Knowledge Program, Yale Law School, USA

Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3
Theme: Open Source models for creating value in emerging markets
Session chair: ms. Dorothy Gordon, Director General, Kofi Annan Center for Excellence in ICTs, Accra, Ghana
- mr. Jon "maddog" Hall, Founder and Chair, Linux International, USA

Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4
Theme: Telecentres and the new opportunities frontier
Session chair: ms. Dorothy Gordon, Director General, Kofi Annan Center for Excellence in ICTs, Accra, Ghana
- Sat-Ed (creative satellite use and rural centers providing education on demand), mr. John Hawker, Sat-Ed
- IDRC/Telecentre.org, mr. Meddie Mayanja, senior program officer, International Development Research Centre (IDRC), Canada
- Rural Decision Support System (RDSS), mr. Rajendra Mahatme, executive director Swawlamban, India
- mr. Lee Thorn, chair, Jhai Foundation, USA

Parallel sessions: Commission on Education

Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1
Theme: ICT for shaping the future of education in Africa
Session chair: prof. Goolam Mohamedbhai, Mauritius
- prof. Alain Senteni, co-chair of the Education Commission, Mauritius
- dr. George Sadowsky, Special Adviser to the U.N. Secretary-General's Special Adviser for Internet Governance and consultant with Internews Network, USA
Panel discussion
Moderator: Goolam Mohamedbhai  
Members: Bob Jolliffe (FOSSFA), Asha Kanwar (COL), George Sadowsky (UN advisor), Alain Senteni (University of Mauritius)

Thursday, 23 August 2007, 10.45-12.15, Parallel 2  
Theme: ICT infrastructure & policies for education  
Session chair: mr. Awol Endris, Ethiopia  
- The BorgouNET Project, mr. Constant Sossoulo, executive director  
  BorgouNET NGO, Benin (Jointly with the Building the infrastructure Commission)  
- SchoolNet Ethiopia, dr. Rahel Bekele, Ethiopia  
- The use of ICT for increasing access to and improving quality in higher education in Africa, prof. Goolam Mohamedbhai, IAU / UNESCO, Chair of the Africa Committee of the UNESCO Forum on Higher Education, Research and Knowledge, Mauritius

Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3  
Theme: ICT-based innovation and change management in education  
Session chair: prof. Alain Senteni, Mauritius  
- The virtual university for small states of the Commonwealth (VUSSC), prof. Asha Kanwar, Vice President of the Commonwealth of Learning (COL), Canada  
- Life long learning, mr. Tom van Weert, Department of ICT and Higher Education of the College of Utrecht, Netherlands / mr. Mike Kendall, executive director, embc Company secretary, embc Procurement Ltd, UK

Panel discussion: Participative approaches and lifelong learning for transforming education in Africa.  
Moderator: Alain Senteni  
Members: Asha Kanwar, Mike Kendall, Tom van Weert

Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4  
Theme: WITFOR projects  
Session chair: dr. Paul Nleya, Botswana  
- MEd ICT in education, prof. Tirussew Teferra and mr. Awol Endris, College of Education of the University of Addis-Ababa and UNESCO-IICBA, Ethiopia  
- Introducing an e-portfolio in eLearning services to empower ICT use in Ethiopian Higher Education, mr. Berhalu Beyene, Ethiopia  
- SADC region projects, follow ups of WITFOR 2005, Paul Nleya, Botswana / Alain Senteni, Mauritius
Parallel sessions: Commission on Empowerment & Participation

Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1
Theme: E-governance approaches to empowerment and participation
Session chair: Mr. Hezekiel Dlamini, UNESCO, Kenya
- Local Governance and ICTs Research Network for Africa (LOG-IN Africa), Prof. Timothy Waema, School of Computing and Informatics, University of Nairobi, Kenya
- Village ICT Project at Lugoba in Tanzania, Mr. Theophilus Mlaki, Information Director, Tanzania Commission for Science and Technology (COSTECH), Tanzania
- Opportunities and Challenges of ICT for Youth Development in Ghana for the Ghana ICT4AD Policy, Mr. Nelson Agyemang, founder and Executive Director of Youth Development Foundation (YDF), Ghana

Thursday, 23 August 2007, 10.45-12.15, Parallel 2
Theme: ICT Industry and public sector empowerment
Session chair: Prof. Timothy Waema, University of Nairobi, Kenya
- E-Government, Mr. Eddie Mc Alone, general manager on vertical markets, Alcatel-Lucent, South Africa
- Microsoft Government Industry, Mr. Rizwan Tufail, Microsoft Public Sector Group Manager
- Public Private Partnerships in Sat-Ed (creative satellite use and rural centers providing education on demand), Mr. John Hawker, Director, Sat-Ed

Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3
Theme: Best practices for community media centres
Session chair: Mr. Theophilus Mlaki, Tanzania Commission for Science and Technology (COSTECH), Tanzania
- The Southern Illinois Radio Information Service (SIRIS), Ms. Vickie Devenport, WSIU Outreach / director of SIRIS, USA
- Knowledge Transfer Beyond Boundaries (NABU) - Cameroon Project: Empowering rural communities to use ICT in the fight against HIV/AIDS, Mr. Louis-Marie Ngamassi, Cameroon
- Best practices in Community Media Centres, Mr. Rizwan Tufail, Microsoft Public Sector Group Manager, South Africa

Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4
Theme: Economic Opportunities of Telecentres
Session chair: Ms. Dorothy Gordon, Director General, Kofi Annan Center
for Excellence in ICTs, Accra, Ghana

- **Sat-Ed (creative satellite use and rural centers providing education on demand), mr. John Hawker**, Sat-Ed
- **IDRC/Telecentre.org, mr. Meddie Mayanja**, senior program officer, International Development Research Centre (IDRC), Canada
- **Rural Decision Support System (RDSS), mr. Rajendra Mahatme**, executive director Swawlamban, India
- **mr. Lee Thorn**, chair, Jhai Foundation, USA

**Parallel sessions: Commission on Environment**

**Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1**

Theme: **Building and maintaining infrastructure, highly qualified personnel**

Session chair: **prof. Dave Swayne**, University of Guelph, Canada

- **Information Communication Technology for Environmental Management, dr. Tewoldeberhan Gebre Egziabhere**, Director General, Federal Environmental Protection Authority, Ethiopia
- **Modeling Soil And Nutrients Loading Into Lake Victoria, Majaliwa Mwanjalolo Jackson-Gilbert**, Makerere University, Uganda

**Thursday, 23 August 2007, 10.45-12.15, Parallel 2**

Theme: **Appropriate environmental ICT technologies**

Session chair: **mr. Tesfaye Woldeyes**, Environmental Protection Authority, Ethiopia

- **"the WaterBase Project", prof. Chris George**, United Nations University, Macau
- **Application of Spatial Decision Support System (SDSS) to reduce erosion in Northern Ethiopia, prof. Zerihune Woldu**, Addis Ababa University, Ethiopia

**Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3**

Theme: **Priority of issues (climate change, water needs, air quality, relative impacts on employment, well-being).**

Session chair:

- **Learning Environmental Sustainability through Local Participation, prof. Knut Erik Solem**, NTNU Trondheim, Norway
- **Environmental ICT needs among small community groups: a First Nations perspective. mr. Lindsay Marshall**, former Chief, Membertou
Mi'kmaq First Nations Band, Canada

- Assessment of flood risk in Dire Dawa town, Eastern Ethiopia using GIS and RS, prof. Dagnachew Legesse, Addis Ababa University, Ethiopia

**Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4**

**Theme: Accessibility to ICT infrastructure**

Session chair: prof. Dave Swayne, University of Guelph, Canada

- Up-to-date assessment of ICT infrastructure available to Environment, dr. Mieso Denko, Guelph University, Canada

**Parallel sessions: Commission on Health**

**Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1**

**Theme: Health IT strategies and national health information systems**

Session chair: H.E. dr. Tedros Adhanom, Minister of Health, Ethiopia

- Ethiopian HMIS strategy, dr. Nejmudin Kedir, Ministry of Health, Ethiopia
- National HMIS experience from other countries, dr. Sundeep Sahay, University of Oslo, Norway
- China national health IT strategy, dr. Caiyou Wang, vice-director, Center for Health Statistics and Information, Ministry of Health, People's Republic of China

**Thursday, 23 August 2007, 10.45-12.15, Parallel 2**

**Theme: IT in healthcare service provision**

Session chair: mr. Solomon Hagos, Ministry of Health, Ethiopia

- Ethiopia and South Africa HIV/AIDS Antiretroviral Treatment system, mr. Mulugeta Alemayehu, Ethiopia
- Telemedicine Initiatives in Ethiopia, dr. Asfaw Atnafu, Head, Radiology Department, AAU- Medical Faculty, Ethiopia

**Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3**

**Theme: Software and systems development for health**

Session chair: prof. Mikko Korpela, University of Kuopio, Finland

- Open source software development experience and challenges, dr. Knut Staring, University of Oslo, Norway
- Global health IT standards development - how to include the south, prof. Eduardo Marques, State University of Rio de Janeiro and CIO at Sao Vicente Hospital, Rio de Janeiro, Brazil
- HELINA collaboration framework, mr. Chris Seebregts, OpenMRS, South Africa
Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4
Theme: Capacity building - education and research for health IT
Session chair: prof. Jorn Braa, University of Oslo, Norway
  • Masters and PhD programs in Health Informatics - Mozambique, Ethiopia, Tanzania, dr. Rahel Bekele, Addis Ababa University, Ethiopia
  • Research on Informatics Development for Health in Africa, prof. Mikko Korpela, Kuopio University, Finland
  • Training health workers in using information and ICT, ms. Louisa Williamson, Health Information Systems Program (HISP), South Africa

Parallel sessions: Commission on Social, Ethical & Legal Issues

Wednesday, 22 August 2007, 16.00 - 17.30, Parallel 1
Theme: Ethical, social and legal implications: opportunities and challenges for developing countries
Session chair: prof. Corien Prins, University of Tilburg, Netherlands
  • Information Science, Legal Education and Distance Learning, dr. Rahel Bekele, Addis Ababa University, Ethiopia
  • E-learning in the Legal domain in Eastern European countries, ms. Heidrun Peters, Ernst-Moritz-Arndt-University Greifswald, Germany

Thursday, 23 August 2007, 10.45-12.15, Parallel 2
Theme: Identity theft
Session chair: ms. Caroline Ncube, University of Cape Town, South Africa
  • Identity theft in South Africa and the USA: a comparative perspective, dr. Sonia Camacho LLB, University of Sheffield, UK
  • Microsoft, ISO standardisation for OOXML and the impact for developing countries, Philipp Schmidt, Free Courseware Project, University of the Western Cape, South Africa

Thursday, 23 August 2007, 14.00 - 15.30, Parallel 3
Theme: MDG Gender portal
Session chair: mr. Waudo Siganga, Computer Society of Kenya, Kenya
  • Portal for African and other women from developing countries to access information on the Millennium Development Goals, dr. Katherine Getao, University of Nairobi, Kenya
Discussion with session participants
Thursday, 23 August 2007, 16.00 - 17.30, Parallel 4

Theme: E-Government and the use of ICT in the judiciary

Session chair: prof. Corien Prins, University of Tilburg, Netherlands

- Ethiopia’s experiences with the use of ICT in the judiciary, mr. Menberetsehai Tadesse, Vice-president Federal Supreme Court, Ethiopia
- ICT and the Tanzanian Judiciary, mr. Alex B. Makulilo, advocate of the High Court, Tanzania
It was a great pleasure for me to welcome all participants of the World Information Forum, held in Addis Ababa from 22 to 24 August 2007. The Government of the Federal Democratic Republic of Ethiopia drew satisfaction from being able to host the 3rd World Information Technology Forum (WITFOR) in collaboration with IFIP.

The Forum, organized under the theme “ICT for Development and Prosperity” is a unique instrument for implementing the Plan of Action of the World Summit on Information Technology. As the Forum brings together ICT educators, experts and other stakeholders from across the globe, it provides developing countries with a unique opportunity to explore, and benefit from, the most recent advances in the ICT field in order to overcome their resource constraints through innovative uses of ICT tools, partnerships and resource sharing.

We, on our part, are keenly aware of the crucial role that ICT can play in the attainment of our development goals, including the Millennium Development Goals. We are determined to optimally utilize ICT for the successful realization of our development strategy. The School Net Program connecting all secondary schools in Ethiopia has been effectively implemented. We have also begun connecting lower level administrative structures in our country (Kebeles and Woredas) with the view to training farmers in the use of better agricultural inputs as well as to providing them with timely information on the agricultural products market. The results registered so far have been encouraging. We intend to expand the effort we are making in the area with even greater resolve to use ICT as a vehicle for the successful realization of our Agriculture-Led Industrialization Development Policy and of our Capacity Building Programme.

It is also fitting to note that this Forum was being convened on the eve of the Ethiopian Millennium, an occasion when Ethiopians will be reflecting on their past achievements and setbacks and on the development challenges that lie ahead.

It would be remiss of me if I failed to mention the ICT divide between developed and developing countries. This divide will have to be bridged if we are to create a truly global communication community. In this regard, this Forum fulfils a pivotal function of assisting the efforts of developing countries to keep pace with the ongoing technological transformation.

I trust that all participants of the Forum had a pleasant stay in Addis Ababa besides a successful meeting.

Meles Zenawi,
Prime Minister of the Federal Democratic Republic of Ethiopia