

INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES

Centre
for
Electronic
Governance



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AHMEDABAD

IFIP WG 9.4

A Newsletter of the
International Federation for Information Processing
Working Group 9.4
and
Centre for Electronic Governance
Indian Institute of Management, Ahmedabad

Volume 20, No. 1, February 2010

WEB VERSION

<http://www.iimahd.ernet.in/egov/ifip/wg.htm>

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Editorial

Welcome to the first issue of the newsletter in 2010. Among others, this issue carries articles that highlight the potential of ICTs to impact development (use of mobiles for micro trading activities in Ghana and use of Internet kiosks for e-payment in Kerala) and two articles which analyze failures of ICT projects for development. The piece by Kentaro Toyama questions the hyped role of access to information.



In spite of numerous publications based on research on a variety of ICT for Development projects, we find that there has been very little impact on practice. A few simple home truths have been identified by many studies but are often ignored in project implementation. In a recent study of the e-District program in rural areas of Uttar Pradesh in India, we discovered that the designers of the e-District application had failed to take cognizance of the existing informal systems, that is, the reality of how services are delivered on the ground. Perhaps a consultative design process would have brought the informal practices to light. For example, when field officials who are hard pressed for time find that it takes 50 seconds to affix a digital signature on an electronic document instead of the 5 seconds it takes on the manual form, they outsource the entire exercise to someone else by giving away their electronic access rights. Therefore, I wonder if what we really need is more research or greater dissemination, training and capacity building of implementers.

There are some aspects of e-government implementation which are still less understood. For example, many countries are bumbling through the formulation of very large and complex national initiatives. In India alarm bells have begun to ring because the five year old National e-Governance Plan (NeGP) has not yielded much by way of e-government projects on the ground.

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Enhancing Micro-Trading Capabilities through Mobile Phones

The Case of Women Traders in Ghana

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Abstract— This paper investigates the impact of mobile phones on the micro-trading activities of women traders in Ghana. The research develops a conceptual model analyzing the impact of mobile phones on pre-trade, during-trade and post-trade activities. A case study approach is adopted and the findings suggest that traders primarily use mobile phones to communicate and exchange information in pre-and post-trade activities. A few traders innovatively also use them to manage customer details and scheduling deliveries in during-trade activities. This innovative use of mobile phones is a function of their pre-knowledge which may have been developed through formal education and/or social networks. Improving information management through mobile phones directly or indirectly contributes to the economic empowerment of the trader. The study concludes that developing the capabilities of the poor to use basic mobile functions and services, beyond voice calls, should define the agenda of future research, policies and strategies towards the “mobiles for development” movement. The conceptual model developed may inform future research in mobile phones and micro-trading activities.

Introduction

There has been a tremendous growth in mobile phone ownership and use globally. Statistics from the International Telecommunication Union [1] tend to suggest that mobile phone subscribers currently constitute 60 percent of the world population. The report also suggests that there are now more mobile phone users in the developing world than in the developed world. In countries like Ghana, it is estimated that, there are 50 mobile phone subscriptions per 100 inhabitants, and further, the ratio of mobile cellular subscriptions to fixed telephone lines is 80 to 1 [2]. The rapid diffusion of this relatively low-cost technology has spurred a development agenda questioning how mobile phones can be harnessed more effectively for socio-economic development in developing economies and other resource-poor contexts.

Initial efforts to finding answers to these questions can be analyzed from two perspectives: the practitioner and academic research perspectives. The initiatives of mobile network operators, banks, entrepreneurs, governments and development agencies characterize efforts from the practitioner perspective. These efforts tend to focus on the design and adoption of mobile applications for micro-finance activities or to enhance

access to financial services [3],[4]. Efforts addressing the impact of mobiles on development concerns and needs – combating poverty and stimulating economic growth – are quite few. This imbalance is also reflected on the academic research front [5]. There is a preponderance of research studies documenting the business models which characterize the initial efforts of practitioners, mobile operators and banks. Academics are yet to catch up with studies seeking development solutions through mobile phones [5],[6]. Some of the few studies making strides at correcting the imbalance argue that there are complexities of factors which affect the poor and hence, make it challenging for researchers to conceptualize the associated needs and impact of mobile phones with one theoretical model or theory [7]. This often contributes to the blurred distinctions between amplification and transformational effects and also between social and production (business) spheres in adoption and usage [3]. Thus, future studies will have to draw on a more comprehensive approach to evaluate the multi-stranded impact of mobile phones on the livelihoods of adopters.

This paper responds to this call for research. The paper investigates the impact of mobile phones on the micro-trading activities of women traders in Ghana. Extant literature has fairly covered studies on the mobile phones usage and mobiles for development in sub-Saharan Africa. The studies include mobile phones and fisherman and farmers in Ghana [8]; mobile phone sharing practices in Ghana [9]; mobile phones and development in Nigeria [6],[10]; and mobile phone ownership and social capital in Tanzania and South Africa [11]. Despite these studies there is a call for more studies to test earlier findings in different contexts and in different micro-economic activities in order to contribute to better understanding of the impact of mobile phones in developing economies. The underpinning research question is: *What is the impact of mobile phones on the micro-trading activities of women traders in Ghana?*

The paper is organized in six sections. Section one covered the introduction of the paper. Section two examines mobile phones and micro-trading to develop the research framework for this study. Section three presents the research methods for the study. Section four presents the case studies of two women traders. The analysis of the cases studies are presented in section five and the conclusions and directions for future research are discussed in section six.

Using Mobiles Phones in Micro-Trading

Transaction cost theory is arguably the most commonly used theory in studying issues relating to assessment of the impact of information and communication technologies (ICTs) on commerce or trade [12],[13],[14]. Transaction costs, described as “the costs of running a system” [15, p. 19], consist of two types of costs: coordination costs and actor

motivation costs [13],[14]. Coordination entails all the information and communication related costs before, during and after a transaction. This includes the cost of searching for products, services, sellers, and buyers, and negotiating and ensuring contract compliance and post-contractual agreements [16],[17]. Actor motivation costs entail the costs of having incomplete or asymmetrical information and imperfect commitment in a transaction. These costs affect decision-making and enforcement of compliance mechanisms, and contribute to the loss of contracts and contractual disputes [12], [14].

It is suggestive from the transaction cost perspective that trading is primarily about information. It involves the sharing and communication of information which leads to the exchange goods and services, and the management of relationships between parties involved. Hence, participants in a transaction seek for innovative ways to minimize costs in acquiring, assessing and communicating information for pre-trade, during-trade and post-trade activities [15].

As a technology, product or service, mobile phones have a potential impact on how trade is conducted. Mobile phones consist of features which offer opportunities for diverse functionalities and applications. Extant research in relating mobile phones and commerce have noted features and attributes including personalization, ubiquity, localization, immediacy, and instant connectivity [18],[19],[20]. Ubiquity highlights easy access to information in real time as well independent communication based on the user's location. Buyers and sellers become relatively accessible and can be contacted anywhere at any time. It also gives them the choice to limit their accessibility to particular persons or time. Personalization works in relation to obtaining new information to create services which helps customize the end-user experience. Localization makes it possible to know where the customer is at a particular moment and to create a match between services, customer's location and preferences.

The combination of these features and attributes of mobile phones in transactional activities in trade has the potential of generating strategic, relational and operations benefits for the trader. These benefits are related to the posited benefits of using ICTs in commerce or trade [21],[22]. However, in this paper, the mobile phones are the form of ICTs being discussed. Operational benefits are associated with the reduction in coordination costs in delivery of products, goods and services in the market place. Traders will be able to communicate directly with potential customers and trading partners on the availability of goods and services. Information on the quality, quantity and delivery times of goods can be exchanged. This may contribute to reduction in costs of searching for goods, services, buyers and sellers; reduction in delivery and inventory costs especially for perishable products;

reduction in risk in frequent long journeys for goods; and increase in the timeliness in decision-making, negotiating and fulfilling transactional terms [8],[10]. Achieving operational benefits can build up to relational benefits.

Relational benefits are associated to the benefits of improved communication and relationships between actors involved in a transaction. The ubiquity, localization and personalization features of mobile phones can lead to disintermediation where traders may bypass or avoid, 'middlemen' and shorten distribution channels to transact directly with potential customers and trading partners [10]. This improved and direct communication may increase the motivation and confidence and understanding between traders and their customers and trading partners. These relationship benefits may build up to strategic benefits.

Strategic benefits are associated with benefits which increase the market "reach" (access new markets) and the performance of traders. Operational and relational benefits can build up the trust for market participants to engage in long term relationships in the good of all [23]. These benefits include the deepening of relationships loyalty and retention between traders and their customers and trading partners; product and service differentiation and personalization; and increase in the "reach" through improved reputation, recommendations and referrals. In effect, increase in market reach could stimulate the growth and performance for the trader.

Beyond the benefits obtained from using mobiles phones, the next question to be asked, is the potential impact or effect on trade. From the mobile phones for development perspective, mobile phones are conceptualized to have three effects on its adopters – incremental or amplification, transformational and production [6],[24]. *Incremental* effects characterize benefits from using mobile phones to improve what traders already do. These include the communication and information exchange with customers and trading partners through use of voice calls and text messages. *Transformational* effects characterize benefits from using mobile phones to create something new – opportunities and access to services and support which were not previously available or readily accessible. These effects include the use of mobile phones to access new services such as mobile banking, mobile advertising, mobile Internet and other related location-based services. *Production* effects characterize benefits from not using mobile phones but trading or selling mobile phones and related services. Production effects may also contribute to transformational effects in the livelihoods of micro-entrepreneurs or retailers engaged in production activities. Examples have been documented in studies on new livelihoods of women in the Grameen Village Payphone initiatives in Uganda, Bangladesh and many others engaged in re-selling airtime vouchers and pre-paid cards [7]. With regards to market traders, we are more likely to expect

incremental and transformational effects. Production effects may be experienced by traders who engage or expand their businesses to engage in the re-sale of airtime vouchers and pre-paid cards.

In summary, regarding micro-trading, traders may use mobile phones in pre-trade, during-trade and post-trade activities. This application of mobile phones in trade may generate operational, relational and strategic benefits which may have an incremental, transformational and/or production effect on the micro-trading activities of traders.

Research Methods

The study seeks to investigate the impact of mobile phones on micro-trading activities of women traders in Ghana. An exploratory case study approach was adopted since it strongly supports the research objective set at the beginning [25]. This research also sought to benefit from the rigors of designing, collecting and analyzing data as discussed by De Vaus [26].

The data was collected over a two-month period; from October to November, 2009. Two sets of interviews were conducted. The first set of interviews was conducted with women traders. Semi-structured interviews were conducted with 17 women traders in two markets in Accra, capital city of Ghana. Two traders were selected from the 17 women traders for an in-depth study of their micro-trading activities. The second set of interviews were conducted with the two of the marketing personnel of one of the five mobile network operators in Ghana and two resellers of mobile pre-paid cards and mobile accessories. There are currently 5 major network operators in Ghana, namely: MTN, TiGO, Zain, Kasapa, and Vodafone. The interviews were conducted with marketing personnel from TiGO and resellers of prepaid cards and mobile accessories with respect to the services that have become beneficial to market traders. The interviews in both sets of interviews were recorded and transcribed, with copies of transcribed interviews and further discussed with the interviewees to check and resolve discrepancies. The approach to analyzing the case study was primarily by use of pattern-matching logic as explained by Yin [30]. We sought for results that can strengthen the validity of our theoretical framework (Figure 1), further by scrutinizing the context of the case and detailing findings to provide answers to the research question.

Case Findings

Case A: The Tomato Retailer

Aunty Akosua (hereafter referred to as AA) is a tomato retail trader at the Makola market in Accra, Ghana. She has a junior high school level of education and has been working as a tomato retailer since June 2008. AA works with Jane who serves as an intermediary between the farmers in the villages and

her. Jane buys the tomatoes at a wholesale price from the farmers and AA retails them at the market.

Prior to owning a mobile phone, communication between AA and Jane was constrained by distance. The limited access to Jane often contributed to poor inventory management, where AA could be out of stock of tomatoes for a week. In such scenarios, AA had to buy from other wholesalers, and that increased her coordination costs. She was then advised by a friend to get a mobile phone for Jane and herself, in order to enhance communication and reduce the cost and risk of frequent long journeys. In December 2008, AA purchased a used Samsung D500 for herself and a Nokia 3315 for Jane. The cost of Jane's mobile phone was deducted from her earnings from trading with AA. They are both using TiGO as their service provider. The cost of the mobile phones is shown in Table 1.

Table 1 Cost of Mobile Handsets Used by Traders

Mobile Handset Model	Cost of New Handset (USD)	Cost of Used Handset (USD)
Samsung D500	35-70	20-35
Nokia 3315/3310	30	20-25

The availability of text messaging function is an added advantage for AA, since it is cheaper to send a text message than making a voice call. She uses text messages alongside voice calls to communicate more frequently with customers. She opined that "*Most of my customers are in the working class, meaning they do not have much time to come to the market. I therefore call or text my customers periodically and ask them if they are in need of any tomatoes and then I deliver to them at their offices before they close*".

The mobile phone enables AA to keep a record of the contact details of her customers. Other tools like calendar and alarms on the mobile phone are also used by AA. She notes that, "*Some of my customers have even scheduled with me the specific days for which they will need my tomatoes. I have therefore placed it on my phone as a reminder so I don't forget them. Therefore, I do not need to be at the Makola market everyday but still make my money*".

The improved communication and information management has improved her relationship with her customers and suppliers.

Case B: The Maize Retailer

Maize is a seasonal produce which requires cost-saving techniques in its trading activities. The old dry maize is preferred to the fresh one, for this reason planting and harvesting are well planned by farmers. Maize wholesalers buy produce from farmers in villages and sell to retailers in Accra, the capital city. Grace is a maize wholesaler who has four retailers in Accra. She has a primary school level of education and learned the trade from her mother. She uses two Nokia 3310 mobile phones and subscribes to MTN and TiGO network services.

The mobile phone has made it easy for her to carry out her transactions more efficiently. She does not have to travel frequently to do her business unless she has to go round to collect her payments. This she does once in a month. Grace explains that, *“I don’t need to come to Accra to supply the maize; all I do is take the orders on the phone and hire a truck to send the commodity. I don’t have to put my life at risk by making unnecessary journeys”*.

Mobile phones make Grace more accessible to her customers which enhance their confidence in trading with her. Grace mentions that *“Supply of maize is controlled by monitoring prices on the market. Prices determine how much goods should be supplied at a point in time. I am able to send simple text messages to inform customers on maize prices and delivery times. Customers are also able to monitor the trucks that bring the commodities to the Makola and Madina markets in Accra. This enables the customers to plan for contingencies”*.

The timely delivery of trade information enhances decision-making in transactions and therefore contributes to reducing actor motivation costs. Without mobile phones, it would be difficult for Grace to coordinate activities more readily.

Discussion

This section discusses the case studies to understand how mobile phones are used in micro-trading activities; the benefits obtained; and the impact on the micro-trading activities.

Mobile Phones and Micro-Trading

Out of the 17 women traders interviewed, 88 percent noted that they used mobile phones for pre-trade activities; 18 percent used them for during-trade activities and 82 percent used them for post-trade activities. The findings suggest that traders tend to find mobile phones to be more useful for pre-trade and post-trade activities. The traders adopted mobile phones because of the perceived benefits obtained by other traders and their competitors. Pre-trade activities include ordering goods directly from farmers or through intermediary wholesalers and informing customers on the availability of goods. Post-trade activities include contacting customers to follow-up on services provided and address inquiries and complaints. These activities are perhaps most critical primary to establishing and maintaining transactions. Hence, as earlier argued, traders are more likely to use mobile phones to reduce the costs of acquiring and communicating information needed for these stages of trade [15]. On the other hand, the 18 percent of traders who used mobile phones for during-trade activities had at least had some of primary level of education, which perhaps contributed to their ability to identify and integrate other mobile functions into during-trade activities. During-trade activities include scheduling the supply of goods through the calendar tools;

calculating sales and purchases; and calling employees in other marketplaces to monitor the demand for goods and pricing strategies of competitors. These traders also often received help from friends, relatives and sometimes customers in learning some of the functions of mobile phones. This ability to identify basic functions in mobile phones and integrate them in trading activities is arguably a function of the some level of education and the perceived ease-of-use the mobile phones they owned. The perceived ease-of-use was influenced by the mobile literacy of the trader which stemmed from informal education through social networks. These interrelationships between technology adoption and use and owner/adopter characteristics are consistent with findings from previous research [3],[27]. The informal education through social networks, however, iterates the blurred distinctions between the social and productive (business) spheres in the adoption and usage of mobile phones [3],[5].

These findings are suggestive of the first lesson:

Lesson One: *The innovative use of mobile phones in micro-trading is influenced by the pre-knowledge of the trader which may have been developed through formal education and/or social networks.*

Benefits Obtained

The benefits obtained by the traders are primarily operational and relational. Both AA and Grace intimated on how mobile phones have helped reduced the cost of coordinating their operations, reduced the risk in making unnecessary journeys, and enhanced communication with customers and trading partners. The enhanced communication with customers enabled the traders to build up a relationship with their customers in which each considers the other as a trusted party. In Case A, AA schedules the various times of customers who need tomatoes using her calendar functionality on her mobile phone. In Case B, customers are able monitor delivery times of goods and plan for contingencies through text messages. This communication medium creates a borderless environment or redefines the “place” factor in transacting business with customers and creating more personalized services for them. Personalized services lead to deepened relationships which can contribute to customer loyalty and retention.

However, the extent of usage of the mobile phones is mediated by affordability and accessibility of mobile services. Concerning accessibility, poor network coverage in rural areas where farms are located often affects communication with trading partners. Wholesalers, like Grace, find it difficult to communicate with customers in Accra when they travel to some villages to buy maize from farmers. Hence, Grace subscribes to two mobile network operators and uses the operator with better network coverage depending on her location. Seven other women traders interviewed also intimated on

subscribing to more than one network operator to take advantage of service promotions and network coverage. Concerning affordability, the high cost of mobile phones and the initial connection charges is another barrier. Traders, as with Grace and AA, usually purchase used-mobile phones. They also consider top-up airtime vouchers to be inexpensive since they are sold in relatively low denominations. According to the personnel from the TiGO mobile network operator, the competition in the mobile industry has increased; each network operator is in a consistent search for the best product for the market. He states that *“With the concept of the triple ‘A’, which makes our services Affordable, Accessible and Available, the ordinary trader in Ghana has the means of getting ‘hooked up’ to this service”*. Promotional services which offer reduced costs of calls to ‘favorites’ and ‘friends and family’ are primarily used by most small businesses and micro-enterprises to communicate with key customers. Therefore even though some retailers earn low incomes, they still find it beneficial to own mobile phones by keeping the cost of owning and operating the mobile phone low. In Case A, AA had to purchase two mobile phones – one for Jane, her employee, and the other, for herself – and subscribe to the same mobile network. Thus, the use of the mobile technology in trading is determined by the readiness of the actors in the transaction to own/access and use a mobile phone. This readiness partly defines the benefits obtained. These findings are suggestive of the second lesson:

Lesson Two: *In micro-trading activities, the benefits obtained by the trader tends to be partly influenced by the extent of mobile phone usage by the trader and other actors – customers and trading partners - in the value chain.*

Impact of Mobile Phones on Micro-Trading

Concerning the impact on trading activities, the traders primarily experienced incremental benefits. The traders predominantly used mobile phones to improve existing trading activities. These include the communication and information exchange with customers and trading partners through use of voice calls and text messages. Little can be said about transformational impact of mobile phones. Contrary, as compared to previous research on the mobile phones usage by fishermen and farmers in Ghana [8], there is no evidence of the use of mobile banking services in these micro-trading activities. This finding, perhaps, stems from the differences in the economic volume and type of transactions involved in fishing and farming as compared to micro-trading activities of traders interviewed in this research. The use of mobile phones for record keeping of customer details and scheduling of deliveries may also be considered as incremental effects since traders traditionally keep such information in notebooks and diaries. There is also no evidence of production effects, none of the

traders were engaged in the selling of mobile services and accessories. They intimated that the retail of mobile pre-paid cards is highly patronized by mobile kiosk entrepreneurs, street vendors and hawkers. This is not an attractive business venture for market traders who traded in food stuffs. The nature of micro-trading activities therefore led to primarily incremental effects on trading activities.

These findings are not far from that of previous research which highlights the absence of transformational impact and more of the presence of additive or incremental impact in the adoption of mobile phones in resource-poor contexts [7], [24]. However, while transformation effects may not be evident in the trading activities, they may be evident in exploring the impact of mobile phones from a more multi-stranded perspective. A multi-stranded impact of mobile phones may include assessing its impact in empowering individuals economically (income, decision-making power and control over economic transactions) and socially (widening network of beneficiaries and gender roles) [7].

Economic empowerment is evident in both case studies presented above. For example, Grace stated that: *“...I am able to send simple text messages to inform customers on maize prices and delivery times.”* AA also emphasized that: *“...Therefore, I do not need to be at the Makola market everyday but still make my money”*.

In this respect, the findings suggest, that the women traders have gained some economic empowerment in improved income from cost reduction and increased decision-making and control in transactions with trading partners and customers. Thus, the transformational impact observed is the economic empowerment for the traders. The findings are suggestive of the third lesson is:

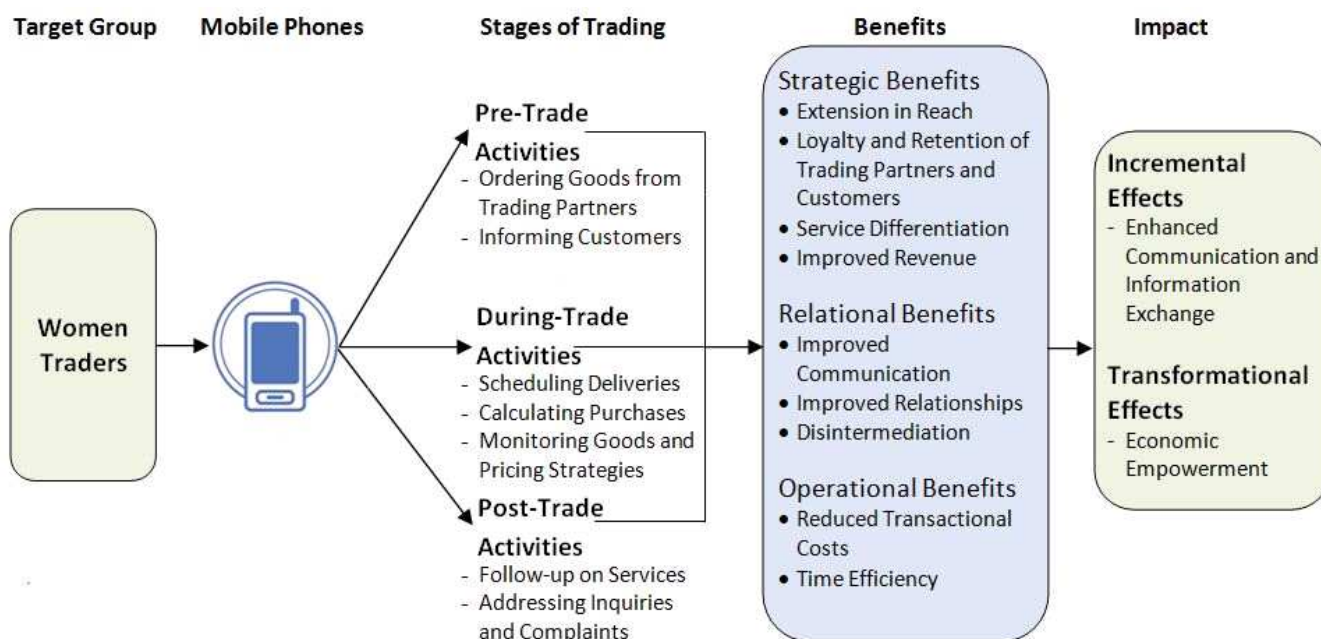
Lesson Three: *In micro-trading activities, since trading is primarily about information, improving information management through mobile phones directly or indirectly enhances decision making, control and income generation, and by this means contributes to the economic empowerment of the trader.*

Figure 1 summarizes the findings in a framework of the impact of mobiles phones on micro-trading activities of women traders in Ghana.

Conclusion

This research has generated valuable insights and lessons for research and practice. The study shows that, regarding micro-trading, traders use mobile phones for primarily pre- and post-trade activities. Some traders, though few in number, innovatively use them to manage customer details and scheduling deliveries during trade. This innovative use of mobile phones in micro-trading is influenced by the pre-knowledge of the trader which may have been developed through formal education and/or social

Figure 1 Impact of Mobile Phones on Micro-Trading Activities of Women Traders in Ghana



networks. The traders obtain operational, relational and strategic benefits which may have incremental and transformational effects. The type of benefits obtained by the trader tends to be partly influenced by the extent of mobile phone usage by the trader and other actors – customers and trading partners - in the value chain. Hence, the readiness of the actors to own and use mobile phones play a critical role in determining the benefits obtained by trader and also by the actors. However, while the benefits obtained primarily lead to incremental effects, the transformational effects do not directly refer to the creation of new services in the micro-trading activities, as earlier argued. They were observed as the economic empowerment of the women traders. In addition, productive effects are absent due to the nature of micro-trading activities researched in this study.

Concerning implications to practice and policy, the innovative use of mobile phones in trading activities should be encouraged. Mobile network operators, development agencies and policy makers should facilitate educational campaigns targeted at educating micro-enterprises and micro-traders on basic mobile functions and services – beyond voice call – which may enhance their business activities. Such advocacy initiatives contribute to empowering their “capability to function”. As Sen [28, p. 75] explains the “capability to function” is what really matters to the poor and non-poor person. In doing so, researchers have to also start investigating on the actual functions and services “the poor” use on the mobile phones, and perhaps, generate insight to inform the design and development of mobile phone functions and services which empower the capabilities of the poor and contribute to sustaining their livelihoods. The work of Parikh and Lazowska [29] in India has taken a step in doing so. However, there is still much to be done across the developing world.

This study was limited to only the case studies of

women traders in Ghana. Future research may focus on a quantitative approach using survey methods to test how the findings are reflective on a larger population of traders and in different developing economies. The conceptual framework, Figure 1, developed in this study may also be used in future research to analyze mobile phones and other micro-trading activities such as taxis services in transportation, and carpenters and potters in manufacturing. Further research is important to develop a better understanding of how mobile phones can help sustain livelihoods in resource-poor contexts.

This work is not in any way exhaustive. The findings and lessons are stepping stones towards the “mobiles for development” movement, which is rapidly expanding. The reality in practice may require more effort and further research.

Acknowledgment

The author wishes to thank Daniel Opoku, Winfred Larkotey, Faustina Mensah-Kwakwa, Vera Quashie and Veronica Torbi for their support as research assistants. This work was supported in part by The Pearl Richards Foundation under a grant for Gender Development Project (www.ewuraba.com).

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Failures in Technological Intervention and the Promise of ICT

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Abstract

This paper throws light on the difficult question about why technological innovation has failed to thrive in low income countries. With the capability to drive humanity's remarkable propensity to make innovations in business, health etc., and to enhance the quality of

life, ICT has raised expectations for a possible economic growth in low income countries. The problem is that ICT is insufficient when simply deployed under the status quo model of development without engaging the important sets of complementary social behaviors and structures in society to support the adoption. The full benefits of ICT deployment will not occur until the technical and social components of the ICT transfer process are harmoniously managed and a fundamental capacity for long term development of the technology is mastered in the poor countries. In this regard, developing countries need to configure viable competencies within local cultures to stimulate technological innovation that can lead to lasting ICT benefits.

Introduction

Technology is regarded by many as a complex social enterprise which extends the human ability to change the world. It equips humans with the ability to cut, shape, or put materials together, move things around and to reach farther with their hands, voices and senses (Rutherford and Ahlgren, 1990). Technology is the engine which drives humanity's remarkable propensity to imitate nature, adapt to environmental conditions and to also make innovations to enhance the quality of life (Alcorn, 1997). Technology is therefore not only vital for human development but also, it is the tool with which humans distinguish themselves from other animal species. The influential relationship between technology and human society dates back to the beginning of human history. There are no known people, now or in human history or even in prehistoric times that have not used technology in some minimal sense to explore the resources in their environments in the attempt to improve their welfare (Ihde, 1990). Every stage of human development has thus been linked with some technology that supplied the tools which were used to construct the social order (Ihde, 1990; Burke, 1985). Whether it was the crude tools of the Stone Age, the agricultural machinery of the green revolution, or the factories of industrialization, the prevailing technology determines the most profitable work people do, the popular tools people use and institutions that come to be established in human societies (Mitchell, 2003, Mumford, 1934).

History reveals that societies that recognize the importance of new technologies and harness them succeed and those that are deprived of access to them, or societies that resist the tide of the technological evolution often fail to advance in human progress. In spite of the important role that technology plays in human advancement, the pattern of access to hi-tech tools shows a significant separation between rich and poor countries. The concentration of wealth, resources and technological innovations in rich countries and the lack of such opportunities in poor countries create a technological dualism which results in imbalances in

access to technology, wealth and power between the rich and poor nations of the world (Singer, 1970). This gap in technological adoption and usage often fuels an endless debate in human society. A similar debate is currently raging over attempts to deploy ICT for development in low income countries. It is this debate and especially how the developing countries of the world may deploy information technology to harness the economic development process which forms the subject matter of discussion in this paper.

This paper seeks to address the question about why technological innovation has failed to take root in the developing world, and then explore ways that ICT can be deployed to stimulate economic growth and help poverty reduction in countries in the region. The first part of the paper discusses the causes of technological failures and asks whether ICT can be used to reverse decades of stagnant economic growth to bring prosperity to developing countries. The paper then examines the economic development potentials of ICT for the poor countries and argues that the potentials may not be realized unless behaviors are developed to support ICT adoption in the region. The technical and social components of the ICT transfer process must also be managed in a synergistically productive relationship to ensure successful adoption. The paper concludes with suggestions for configuring viable competencies within local cultures to stimulate technological innovation that can lead to lasting ICT benefits.

The Promise of ICT for Development in Low Income Countries

Information flow is critical to the socioeconomic activities that make up the economic development process. The economic benefits of information handling technologies are derived from a long succession of innovations that played crucial enabling roles in past economic development processes in Europe, North America and parts of Asia (Beninger, 1986). Through timely delivery of information requirements for production, marketing and consumption, ICT makes possible the provision of credits, supply of raw materials and the distribution and sale of goods. Thus, ICT is not a simple connection between people, but a vital link in the chain of the economic development process itself (Hudson, 2001). ICT deployment and economic development are therefore not mutually exclusive. Rather, the two work to reinforce each other. Economic development is linked with growth in access to ICT whilst efficient applications of the tools can lead to greater wealth, prosperity and economic development in low income countries. Besides facilitating the production process, information dissemination through such ICT tools as mobile phones is critical to improvements in human welfare, education, health and the empowerment of under-represented groups. For example, the majority

of poor people in developing countries are not just poor because they lack the essential resources in life. In many cases, the people are poor and continue to be so because they lack access to information about income-earning opportunities, going market prices for their produce and also lack the knowledge about local institutions that shape their lives (Marker et. al., 2002). The poor therefore stands to benefit tremendously from improved information flows through society that may improve the effectiveness of government agencies and also help them to access markets and institutions that directly affect their welfare.

Unlike previous engines of economic development (i.e. factories, industry, etc.) whose influences were limited to urban enclaves in the developing world, beneficial impacts of ICT tools can reach anywhere via wireless networks without an expensive landline infrastructure and with little capital outlay. As a result, tools such as the mobile phone provide a special advantage to many people in developing countries who have in the past been excluded from the means of economic advancement. While market solutions have not proven to be useful for redistributing economic rewards fairly between urban and rural dwellers in these countries, the unique openness of information technology could reverse this trend and spread economic benefits around (Attali 1997). The social and economic dividends of ICT adoption are therefore very high in developing countries partly because wireless networks expand interactivity between rural and urban locations to spread economic benefits to communities in the hinterlands. ICT can therefore be an enabling tool for meeting many of the development challenges that face low income countries of the world (Chacko, 2005).

On the other hand, the ICT technology is certainly insufficient when simply deployed under the status quo mix of policies without engaging the important set of complementary social behaviors and structures within the communities to support its adoption and sustained applications. For low income countries that are attempting to develop with ICT, successful deployment of the technology requires a rejection of the mainstream rationality that has dominated economic development policy since the last century. Instead reliance on locally creative and developmentalist policies that closely resemble strategies that the Western developed nations adopted, when they themselves were trying to industrialize, would be beneficial.(Chang, 2007; Haque, 1999).

Why Technological Intervention Fails in Developing Countries

The adoption and use of a new technology causes disruptions in the socio-cultural system of a nation and induces a change from established practices to distinctly different and complex forms of social

practice. The deployment of ICT into the predominantly traditional societies of developing countries is therefore very disruptive. In view of this, a seamless integration of both the technical and socio-cultural systems of societies where technology transfer takes place is necessary for a thriving ICT deployment. Unfortunately, technological transfer to developing countries is driven by a perspective that is based on the development experience of Western industrialized nations. Under this Eurocentric rationality, progress in technological adoption in the poor countries is measured by the capacities of the poor countries to absorb and replicate practices that have already occurred in Western industrialized nations (Servaes & Malikhao, 2002). Even though this rationality conveys only one particular set of values, it still dominates over other forms of rationality pursued in all development projects that occur in low income countries (Avgerou, 2000). While this rationality has been instrumental in the definition of technological and economic development problems in the poor countries, and the solutions to those problems, it has been unsuccessful in streamlining people's behavior towards the achievement of such solutions (Avgerou, 2000). The failure to mobilize behavior in support of technological innovation is partly due to the fact that sociocultural systems in Western Industrialized nations and the developing countries are different with respect to the degree to which they tamper economic productivity and efficiency with social values. The rationality of the mainstream development model is at variance with traditional values and belief systems in the communities where reciprocative and redistributive rationality displayed in beliefs such as mutual responsibility, solidarity among groups and common welfare of group members prevail over competition and the freedom of enterprise to accumulate capital (Corea, 2000). Consequently, attempts to improve the living conditions of the people by deploying technology via this economic rationality take on new meanings. As a result, the technology transfer process generates mainly negative reactions from the people. The resistance occurs because the new incompatible arrangements that accompany the deployment of technology threatens entrenched interests, local power structures and ingrained ways of doing things in the society (Avgerou, 2001; Madon, 1993).

Shoib and Nandhakumar (2003) have observed that the resistance which results from the clash of rationalities results in two main courses of action. First, it sparks off frantic calls from supporters of the mainstream rationality to change the local systems of values and reasoning and rather adopt the Western rationality which is conducive to technological adoption and modernization. This approach proves to be sustainable only among a small section of the society such as the rich and educated found mainly in urban areas. The majority of the people reject the economic rationality

and ultimately the inconsistency between the rationale for transferring the technology and the rationality derived from historically evolved local systems of values leads to the abandonment of the project. Avgerou, (2000:1) has observed that often when this happens, the communities are erroneously labeled “as problematic hosts of technology” on the grounds that they do not only lack the economic resources and the capabilities to develop and deploy modern infrastructure, but that they also do not to make good use of technology transfer and adoption. Second, resistance to the technological project leads to demands from critics for the withdrawal of the technology on the justification that it is the product of Western rationality which is inappropriate for the people in developing countries. The viewpoint which discards ICT altogether as irrelevant or inappropriate for adoption in developing countries is misguided because the idea conveys the critique of ICT as inherently serving one particular system of values and hence bound to perpetuate the subjugation of other identities (Shoib and Nandhakumar, 2003). We know today that technology is not only constituted within its social milieu but it has also proved to be shapeable and capable of serving radically different ends including social control and surveillance, or emancipation and empowerment (Corea, 2000). Thus, in response to the assertion that some cultures are incapable of economic development, Chang (2007), a Harvard Economist, has explained that not too long ago, the Germans were considered to be corrupt and the Japanese people were said to be lazy (terms that are used today to describe people in developing countries). The author explains that after the countries attained economic development nobody considers the Japanese to be lazy or the Germans to be corrupt. Chan therefore argues that culture is not a determinant of economic development (as it is often written of cultures in underdeveloped countries), but it is economic development which alters culture (ibid).

The problem with relying on locally derived rationalities and institutional mechanisms for technology transfer in developing countries is not that the model does not work. Unquestionably, ICT-related projects such as the Mpesa mobile banking scheme in Kenya and the Grameen Telecom and Banking initiatives in Bangladesh that are based on local rationalities and preferences reach several million villagers in Kenya and Bangladesh respectively (BBC, 2009). The mobile banking schemes introduce many villagers who operate mainly in the informal economic sector outside of the national economies into the national formal economy – a move that can enhance revenue collection for economic development. The problem is rather that examples of technological projects that are based purely on local sociocultural systems and everyday practices of the people are not popular in international and even national development

plans and have not therefore been widely applied. Accordingly, the failures of technological transfer to developing countries are not because a specific rationality is embedded in a particular technology which makes it inherently inappropriate for adoption. Rather, Avgerou (2000) has rightly argued that often particular technologies are mobilized in support of particular regimes of truth and transferred to developing countries as part of transferring those particular ways of organizing economic and social affairs. The failures of technological innovation in developing countries are therefore symptomatic of a rationality that is fundamentally at odds to the objectives the projects were designed to achieve in the various countries (ibid).

Another recurring feature of technological failures in developing countries is a flaw in the methodology for implementing technology projects in the region. The rationality for transferring technology to the poor countries makes no room for changes in the culture and human behaviors that will support the long term adoption and applications of the technology. On the other hand, we find in technologically advanced societies that the culture of the people embodies sets of behaviors that propel society towards continuous technological innovation and increasing economic output. The behavior involves a learning and problem solving orientation which manifests itself in a willingness to solve problems using ingenious means and whatever resources are available for the sake of improvement and anticipated rewards (Corea, 2007). Conversely, stagnation occurs in cultural systems (such as those in developing countries) that are not geared towards technological innovation for behavior that produces continuous change is not being generated (ibid). However, this lack of innovation is not a reflection of the failures of the people that compose the social system but rather, a failure of the architecture of the social system itself in not producing behavior that is conducive to technological adoption (Goulet, 1971). For example, through sustained and growing subscription to mobile phones and wireless networks, citizens of many developing countries have aptly demonstrated that they are capable of engaging in behaviors that are supportive of technological adoption. What’s missing is leadership and the courage to design and implement changes in the critical aspects of the social milieu to generate the learning of behaviors that support technological innovation.

Thus, whereas significant potentials exist for the adoption and use of ICT for development in developing countries, the ability to manage the transition from adoption to applications and the realization of the potential benefits is vital for a successful outcome. An important challenge for the deployment of ICT in the low income countries therefore is the need to study the reinvention of

traditional social systems to generate behaviors that will facilitate sustained technological innovation. The long term nurturing of attitudes and behavior that intrinsically motivate citizens of developing countries to engage technology permanently is therefore a much more important issue to be addressed in ICT adoption than the large scale implementation of costly ICT projects that will immediately be rendered obsolete through structurally-induced inertia (Madon, 1993). It is therefore important for the low income countries that are presently characterized by slowly changing cultural systems to generate sets of learning behaviors that are aimed at continuous innovation since that will in the long run materialize in the use of advanced technologies and the qualitative refinements in life expected from advances in technology (Corea, 2000).

Another reason for the failure of technological innovation in poor countries is the rationality of technological deployment which emphasizes economic growth to the total neglect of socio-cultural development. This is particularly true for ICT which many believe developing countries can use to correct decades of stagnant economic growth and leapfrog several stages of development into economic prosperity (ILO, 2001). Whilst economic growth may be the optimal outcome of ICT adoption, standard ICT tools such as the mobile phone and even personal computers are not necessarily the best kinds of tools that can help bring about rapid economic prosperity into developing countries. Unlike the industrialized countries of the world with large and established service and manufacturing sectors that make intensive use of ICT, the economies of developing countries are dominated by raw material production and subsistence activities where information technology plays less an effective role in the production process. As a result, ICT adds much less value to the economic production processes in these countries than it does in the economies of industrialized countries. Additionally, domestic markets of developing countries include large numbers of people with significantly low disposable incomes such that the responses to opportunities offered by ICT are often recorded more in social uses than direct economic applications of the technology (OECD, 2003). It is however important to mention that factors that inhibit ICT deployment for economic development in developing countries do not suggest that ICT investment will not happen, or that benefits in economic productivity and human welfare will not occur in these countries. Rather, investments in ICT and resulting economic benefits will take longer to materialize in the developing world than it will do in technologically advanced nations such as USA and Japan or even in transitional economies such as Brazil and India (OECD, 2003). Measuring the initial success of ICT deployment in developing countries should not therefore be based solely on rates of economic growth but also, on progressive

enhancements to the social and overall well being of the people.

Cultivating Favorable Environments for Effective Deployment of ICT

The cultural systems in developing countries of the world are often erroneously dismissed as unimportant and hence neglected in efforts to transfer technology into the region. However, the local culture is one unique institution which strongly determines which development intervention will succeed and which will fail (Mitchell, 2003). As explained earlier, the discounting of the historically-evolved systems of values and reasoning within technology-adopting low income countries has been a major contributing factor to the failures in technological innovation that occur in the region. This is because the socio-cultural system influences not only the capability to create socially fitting ways for using technology but also, the ability to manage their integration into work processes and human activities (Davenport, 1993; Porter, 1990). Culture dictates the initial uses of technology and also determines the types of usage and whether a technology such as ICT may be mainly used for social or economic activities. Even though ICT tools are known to easily incorporate multiple uses and different modes of organization because of their reflexivity and mobility that allow for diverse applications, the tools do not create jobs by themselves. By their nature, ICT tools must necessarily be incorporated into day-to-day economic and social lives of the people and be actively used for their development potentials to be fully realized. Users must therefore be engaged in some form of activity and then make elaborate plans to take advantage of capabilities of the technology to network their businesses and social tasks. In industrialized nations with long traditions of technological innovation, the choices and uses of technology are influenced mainly by economic factors such as the drive for profits, capital accumulation and increased market shares. On the other hand, in developing countries where industrial production is low and economic activities involve very low applications of technology, specific plans need to be put in place to redirect and steer the applications of technology into productive ventures. In the absence of such guiding plans, ICT tools (e.g. mobile phone) are used to confirm and/or promote existing socio-cultural practices that sometimes contribute very little to national economic development.

It is therefore important for developing countries whose citizens have already embarked on mass subscription to such ICT tools as mobile phones, to develop competencies from their cultures to guide and redirect the applications of the technology into viable and productive activities. In this regard, Bunker (2001) has identified some of these competencies that may be adopted to direct applications of ICT into

economically viable ventures. The first competency is related to the ability to envision new products, new services or new functions from a consideration of the potential capabilities of the available ICT tools. The recognition of potentially new uses of the tools could result from a search for technological solutions to existing problems, or the exploration of new problems with the tools (Hammer & Champy, 1993). An example of this is the use of mobile phones in mobile banking to expedite money transfer from urban to rural areas. The second competency involves the ability to identify the potential capability of the available ICT tools for improving existing production, packaging or marketing practices in the community. For example, mobile phones can be used to relay daily retail prices of goods sold in urban areas to small scale producers in rural areas to enhance the profits of producers. The third competency depends on the ability to recognize the potentials for need-driven satisfaction or new demands among consumers, and figure out ways that ICT capabilities can be developed to support or fulfill such potentially new demands. Equally important is the competency which is indispensable to the previous three and entails the ability to skillfully manage and bring about changes in practices of production or packaging, and corresponding changes in the functionality of ICT tools, to achieve the expected improvements.

Designing the competencies from local culture and belief systems requires (a) the ability to recognize potential new applications of information technology and (b) the capability to mobilize and manage human resources to achieve the desired uses and the transformations in human behavior that will support and sustain those uses. In this enterprise, education is important because those charged with the duty to examine local practices and develop new uses for ICT will need to open up to new ideas and then reframe the values and traditions in society to match capabilities of the new technology (Bunker, 2001). Incentive schemes would also serve to enlist commitment to the technological adoption as well as sustain the motivation to change the behavior of potential consumers following the technological adoption (Ciborra, 1999). The competencies can emerge from grassroots experimentation or may result from planned deliberations and consultation with stakeholders in the community.

Conclusion

The desire to understand and realize the potential benefits of ICT for economic development in low income countries have grown in recent times but there is little evidence that the rationality which currently guides economic development and ICT deployment can deliver economic prosperity to the poor countries of the world. Pertinent questions remain about why technological adoption fails in developing countries

and yet very little effort has been made to examine the nature of technological adoption beyond the perspective of a development intervention. It seems the urgency to see developing countries catch up with the information rich nations and the promise of information technology have overshadowed the need to sufficiently assess the causes of failure in technological adoption ahead of ICT deployment in low income countries. There is indeed value in ICT deployment and information dissemination in developing countries but the implementation of ICT projects ought to be complemented by substantial local inputs. For the potentials of the ICTs to be translated into digital opportunities to assist with development in the poor countries, the current rationality for transferring technology into the region must change and assumptions that underlie current development must be discarded. Instead the countries need to rely on creative strategies that are based on locally evolved value and belief systems. A way must also be found to manage a flawless integration of the changes in both the technical and socio-cultural systems that accompany the deployment of ICT. A successful ICT deployment will thus require that we look beyond the very strong anticipations of ICT usage outlined in developed countries and in mainstream policies and rather identify and nurture competencies within local cultures that are compatible with sustained applications and development of the technology.

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E-Pay: Improving Government - Citizen Interaction

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Background

The birth of the Internet has ushered in a new paradigm of development. By revolutionising the means of information and service delivery, the Internet has created an effective and efficient means of developing underdeveloped regions and people. In the words of the former Secretary General of the United Nations, Kofi Annan, "The great democratizing power of information has given us all the chance to effect change and alleviate poverty in ways we cannot even imagine today. With information on our side, with knowledge a potential for all, the path to poverty can be reversed".¹

The all-encompassing power of the Internet has been recognized with cognizance by countries and Governments which are trying to fight the scourge of poverty and usher in prosperity. The undeniable growth of Internet is supported by the fact that it "took 75 years for telephone to reach 50 million users when it was invented, it has taken the World Wide Web (WWW) only 4 years to reach the same number of users".² Attempts at furthering development initiatives through the medium of the Internet have given rise to concept of e-governance. Springing mostly as a "copy of e-commerce into public sector"³ in the beginning of the 21st century, e-governance is the use of "technology to accomplish reform by fostering transparency, eliminating distance and other divides, and empowering people to participate in the political

¹ Lankester, Chuck, (1998), Speech on the topic "The Internet and Developing Countries: A New Paradigm" delivered at 'Networks' at Bangalore, 3-6 June 1998, retrieved from <http://www.sdn.org/docs/papers/Banglr.htm> on 13th November 2009

² "UN Global E-government Readiness Report 2005 - From E-government to E-inclusion", Department of Economic and Social Affairs, Division for Public Administration and Development Management, retrieved from <http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021888.pdf> on 13th November 2009

³ Spremic, Mario et.al (2009), "E-Government in Transition Economies", World Academy of Science, Engineering and Technology 53 2009, retrieved from <http://www.waset.org/journals/waset/v53/v53-84.pdf> on 13th November 2009

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processes that affect their lives”.¹ Since its evolution, e-governance has flourished to become a major arena of thought with four distinct models, based on the participants engaged in e-government activities. The models are Government to Citizens (G2C), Government to Business (G2B), Government to Employees (G2E) and finally Government to Government (G2G). Of all the models of e-governance, the G2C interface is perhaps the most discussed and thought of, owing to its ability to change the life of citizens.

The State of Kerala woke up to the power of e-governance and G2C quite ahead of the other regions of India. Recognised for its pioneering ICT-based countries in the country and the world, the administrators and other key stakeholders in Kerala realised that implementation of e-governance cannot be an overnight venture. Rather it would take coherent strategising and eons of effort.

The E-Government Handbook for Developing Countries² has identified e-literacy as one of the 17 challenges and opportunities for implementation of e-governance initiatives. E-literacy or IT literacy becomes a challenge because e-governance cannot succeed if the citizens are not IT literate. Interestingly it also emerges as a simultaneous opportunity, for e-literacy can be achieved through e-governance.

Envisioning e-literacy both as a challenge and an opportunity, the Government of Kerala launched the project of Akshaya (the word meaning ‘perpetuating prosperity’) on 18th November 2002. Piloted in one of the most backward districts of Malappuram in Kerala, the purpose of this project was multi-fold. These include imparting basic IT literacy to at least one member in each of the 6.5 million families in Kerala, generating and distributing locally relevant content, improving public delivery of services and creating employment opportunities. Through this e-literacy programme, the Government wanted to address and redress three issues, viz., low Internet penetration, low e-literacy rate and high costs of availing services. With e-literacy taken care of, the Akshaya project was to emerge as a platform for implementing many e-governance programmes.

¹ “The E-Government Handbook for Developing Countries”, A Project of InfoDev and The Center for Democracy & Technology, retrieved from www.infodev.org/en/Document.16.pdf on 13th November 2009

² “The E-Government Handbook for Developing Countries”, A Project of InfoDev and The Center for Democracy & Technology, retrieved from www.infodev.org/en/Document.16.pdf on 13th November 2009

Developed as a public-private partnership based project, the Akshaya centres or Akshaya e-kendras were favourably received by the people of Malappuram. Since June 2003, around six hundred thousand people have been made IT and Internet savvy, earning Malappuram the epithet of being India’s first 100 per cent e-literate district. The project also created over 620 kiosks and generated employment to over 2500 people in the area. Enthused with the response, the Government decided to launch the project across the State and equip the e-kendras to deliver additional services.

E-Pay – The Purpose Behind

In a democratic set-up like India, many exchanges between the citizens and the Government are mandated. Some of them include payment of income tax, property tax and other utility bills. Owing to the fact that these essential services are provided by various Government departments and wings, the citizens are forced to visit multiple offices to fulfil their obligations. This results in wastage of precious time, thus impinging on the productivity of the nation as a whole.

To help the citizens of Kerala make all their obligatory payments under one roof, the Government of Kerala initiated the pioneering venture of Fast Reliable Instant Effective Network for Distribution of Services (FRIENDS) as a pilot in Trivandrum Corporation in 2000. This facility was positively welcomed by the citizens, prompting the Government to roll-out the project to the other districts as well. The success of the pilot and the subsequent district-level ventures clearly brought the need and efficacy for such services.

With Akshaya e-kendras expanding the e-literate base of Kerala, the Government, in line with its original strategy, felt that additional services can be provided through these centres. The E-pay facility was born as part of the second phase of expansion of the Akshaya centres to extend the availability of integrated services, enjoyed by urban Kerala to rural Kerala as well. The extension of single window services to the rural population has helped to rectify any digital exclusion that might have unintentionally crept in during the initial stages of the FRIENDS project.

Objectives

The main aim of the E-pay project is to create an integrated electronic payment facility for rural Kerala and to save the citizens the hassle of visiting multiple offices to make mandatory payments. The sub-objectives of the project include:

- Digital inclusion of the rural population
- Creation of local employment

E-Pay -Project

A project of the Kerala State IT Mission (KSITM); the

IT implementation wing of the Kerala Government, with the technical support from Centre for Development of Imaging Technology (C-DIT), the E-pay project facilitates payment electronically/digitally. The project hinges on the Akshaya centres set up by the Government across the State.

Extending the scope of Akshaya from centres of e-literacy to centres for multiple services delivery called for technological additions, particularly the building of a wireless network. The Akshaya project, which has the distinction of being the largest rural wireless network in India, deploys hybrid wireless technology Wireless IP in Local Loop (WipLL) and Versatile Intelligent Network (VINE). The WipLL is a high capacity point-to-multipoint wireless wide area networking system that utilizes IP technology and has an operating range in excess of 10 km Line of Sight (LOS) and several kilometers Non Line of Sight (NLOS). This technology carries voice, video, and data services on a single platform over the metropolitan area. It supports Quality of Service (QoS) and Bandwidth on Demand (BoD). VINE is a new networking technology that overcomes the non line-of-sight obstacles and minimizes initial up-front costs of developing networks. Hard-to-reach locations that are obstructed can easily be reached once the VINE spreads into that neighbourhood. The Akshaya centres were thus enabled to emerge as self-sustaining units with five computers and other infrastructure worth up to Rs. 400,000 per center. To ensure access and ease of use of the services, the Government is striving to ensure the presence of an Akshaya centre within a radius of 3 km from every household.

With infrastructural requirements catered to, the E-pay project was launched in 98 Akshaya centres in Malappuram district in August 2004 as an online single-window facility for collecting various utility bills from the citizens. It was further rolled out to seven more districts in the beginning of 2008. Currently, one-stop bill-payment Akshaya centres have come up in all the 14 districts of the State.

This was made possible through the help of Kerala's computerized bill payment facility (e-kendra.org). Citizens of Kerala have paid more than 100,000 bills at 'Akshaya Centers', one-stop bill payment shops spread across all 14 districts of the state. Starting from March 2009 and up to December 2009, the Akshaya e-kendras have collected e-payments over Rs. 920 million in over 2.6 million transactions. The transaction summary of Akshaya centres during this period is shown in the table below:

Transaction Summary – March to December 2009

<i>Period</i>	<i>Amount in Rs.</i>	<i>Number of Transactions</i>
Up to March-09	593,210,788	1,674,474
April-09	31,853,526	88,499
May-09	37,677,377	101,219

<i>Period</i>	<i>Amount in Rs.</i>	<i>Number of Transactions</i>
June-09	37,949,951	101,907
July-09	36,473,895	103,739
August-09	35,856,884	101,152
September-09	34,368,152	97,500
October-09	40,618,829	113,417
November-09	36,703,183	105,927
December-09	42,056,007	122,437
TOTAL	926,768,592	2,610,271

A public-private partnership model, the Akshaya entrepreneurs constitute the private participation in this model. Other stakeholders in the model are the FRIENDS Centres of Government of Kerala. Banking support is provided by the online division of the State Bank of India (SBI). The counsel of the Panchayati Raj Institutions is largely relied upon for effective project implementation.

An Akshaya entrepreneur can provide E-pay services by following certain well-laid steps, which have been displayed in the website www.e-kendra.org. To join the scheme, the entrepreneurs will have to submit a list of offices in their area of operation, bills of interests, consumer size, projected transactions per month, nearest SBI branch etc. Once this is approved, the entrepreneur has to open an Internet banking account with SBI. An undertaking has to be then signed at the Akshaya office, which authorises the entrepreneur to commence Government payment collection in a particular area. An Access PIN from the ePayment Gateway can be obtained by confirming bank account numbers, email and telephone address along with batch limits from the bank. The entrepreneur is then eligible to make collections.

To avail this facility of making all payments under a single roof, citizens have to register themselves at their nearest Akshaya e-kendra, each with a unique ID. Upon registration, they are issued a unique Consumer Number. After quoting the e-kendra ID or Consumer Number, the citizen can make multiple and diverse utility payments in one go, with least hassle. Citizens can verify the Akshaya E-pay receipts with the receipt number anytime, anywhere at www.e-kendra.org/bill. The website also provides for verifying past payments online.

The amount collected by the Akshaya entrepreneurs through Akshaya E-pay is transferred online from the entrepreneur's account to FRIENDS account the same day itself. The Project Manager of FRIENDS transfers the fund collected through E-pay to the corresponding bank account opened by the participating departments the very next day. Presently the project accepts remittances of Electricity and Water Bills, BSNL Land Line and Mobile besides University fees.

With an investment of Rs.5.74 million, the deployment includes modest IT infrastructure: two IBM X Series

servers powered by Windows Server 2.3, Visual Studio .NET, and SQL Server. The Akshaya e-pay application is browser based, developed on Dot Net platform with MS SQL as RDBMS. The site is secured with Verisign and the server is located at Data Centre set up by Government of Kerala. To ensure transparency and also to encourage entrepreneurs for their good work, the website also displays month-on-month, the transaction volume and value on the site, along with email addresses of the best performing entrepreneurs. An Implementation Committee headed by the District Collector and represented by the Akshaya Project and user department representatives has been constituted to look after the project implementation.

FREES (Friends Re-engineered and Enterprise Enabled Software)

Buoyed by the widespread acceptance of the E-pay and FRIENDS project, the KSITM is working to expand the services provided by converting the entire application software into a web enabled one. Called FREES (Friends Re-engineered and Enterprise Enabled Software), this software will enable citizens make various utility payments, taxes and other fees from any Akshaya and FRIENDS centre.

Core Project Features

Thus the core project features are:

- Facility for online updating of backend data
- Cash transfer through secure SBI bank bone
- Payments to departments settled by FRIENDS in the very next day. (FRIENDS – Fast Reliable Instant Effective Network for Disbursement of Services - is a single window utility bill payment centre)
- Online scrolls to the participating departments
- Facility for verification of E-pay receipts by citizens anytime, anywhere at www.e-kendra.org/bill

Achievements

- Services are made within easy reach of consumers belonging to rural areas, thereby saving consumers' costs on distant and recurrent travel.
- It saves the customers, especially in remote areas, of the energy expended going to various Government offices to pay the bills, endlessly in long queues.
- E-Pay facility is available to the public at Akshaya e-kendras at a nominal cost of Rs.5 or Rs.6 per transaction.
- Flexible timing to suit the convenience of the customers
- Traditionally an official from each department is entrusted the duty of collecting tax and various charges, thus taking his/her valuable time. With the switch-over to the E-pay counters, the departments can save the cost for maintaining the

collection sections. The valuable time and energy of the employee/s could also be used for more constructive jobs within the department.

- As the E-pay platform offers an online payment facility, the time required at the E-pay counters is minimal compared to the manual system of recording data and giving receipts in black and white.
- The introduction of the E-pay serves as an additional source of revenue for Akshaya centres.
- The sustainability of the project is guaranteed through community participation as the Akshaya centres heavily lean on the local bodies.

Future

The E-pay project has chalked out plans for the future. This includes enlisting more departments such as Commercial Tax Department and Welfare Department in the E-pay platform. The project also envisages the enabling all the 2200 Akshaya centres across the State with the E-pay facility. The target is to ensure that there are at least two E-pay centres in every Village Panchayat of Kerala. Introduction of an online payment facility with credit/debit cards is also on the cards. The installation of FREES will accentuate the provision of online citizenry services even more.

Conclusion

Delivery of Internet services to rural communities was one of the biggest challenges in bringing IT to the masses. By creating the single window Akshaya E-pay centres, the Government of Kerala has taken a step towards bridging the urban-rural divide.

The single window facility is creating new patterns of service delivery and promises to change the Government/citizen relationship. It strives to improve the way citizens conduct business with the Government, thereby enhancing efficiency of Government functioning. Finally, the creation of local employment and the additional revenues that this project brings to rural entrepreneurs helps to achieve equitable development.

Information is not the Bottleneck

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Are you as rich as you'd like to be? Are you as knowledgeable as you'd like to be? Are you as compassionate as you'd like to be? Few of us can answer "yes" to all three questions, and yet, anyone reading this newsletter has access to the information necessary to be richer, smarter, or kinder... For example, a Google search estimates that there are over 52 million pages providing information on "how to be

rich,” and many of the links from the first page of results take you directly to sincere advice on becoming richer (Google 2010).

If you want to become a world-class engineer or scientist, the Massachusetts Institute of Technology makes a significant amount of its courseware – lecture notes, exams, and videos of lectures – all available online, free (MIT 2010). And, if you’d like to know how to be more compassionate, the Dalai Lama’s official website provides plenty of suggestions and encouragement (Dalai Lama 2010).

In short, today’s Internet provides the *information* to answer just about any question we could ask, and just about any problem we could pose. But, as we are ourselves proof, access to the information does not necessarily lead to immediate benefit from the information: Information is not the bottleneck to our achieving whatever aspirations we may have. We may want to live a long, healthy life, but it’s not because we don’t know that a good diet and moderate exercise are healthful that we fill up on *chaat* and fail to get up for early morning walks. It’s because we have appointments to keep, children to feed, programs to run, and staffs to manage. It’s because at the end of a hard day, it’s much easier to munch on some chips and pop ourselves in front of the television, than to take the walk we didn’t take in the morning.

And, if it’s hard for us to implement knowledge on the Internet for our own sakes – we, with a solid education, decent savings, and enough time to read newsletters about e-government – imagine how much harder it would be for someone whose job consists of hard menial tasks for 12+ hours a day; whose daily wages go mostly to feeding the family; who struggles to read because formal schooling stopped with primary school. In the midst of this kind of life – which is the life of many urban construction workers and farm wage workers – how likely is it that mere access to the Internet, even if free, will result in new skills acquired, new habits formed, or new lives lived? It’s completely absurd!

Yet, this absurdity – the belief that supplying access to information in the form of the Internet will magically transform the world’s poorest communities – underlies many ICT-for-development projects.

Here, for example, are the opening two sentences of the vision statement for the World Wide Web Foundation: “We envision a world where all people are empowered by the Web. Everyone — regardless of language, ability, location, gender, age or income — will be able to communicate and collaborate, create valued content, and access the information that they need to improve their lives and communities” (World Wide Web Foundation, 2010). Their website makes it

clear that when they say “all people,” they mean poor populations in development countries.¹

These visions are beautiful and seductive in their rhetoric, and the organizations behind these efforts are laudable in their intent. Certainly, it would be great to see the potential power of the Internet positively impact the world – I am not suggesting otherwise. But, carefully wrapped up in this rhetoric is the implication that it is access to the Internet, by itself that enables positive impact, when in fact, much, much, *much* more than the Internet is almost always needed for cost-effective impact.

Some proponents of “bytes for all” have become more sophisticated with respect to this critique. Some admit that the Internet alone isn’t sufficient. You actually need content, too. Or, you need services, too. Or, you need capable partners, too. But, these arguments are still suggesting that it is primarily the Internet that makes the difference. Well, let me suggest that if you had good content, it could be printed on paper or broadcast on TV for greater reach more inexpensively. Or, if you think you need good services, let’s see the services first, before talking about the Internet. And, finally, if you have good partners who are doing the lion’s share of the hard work... well, shouldn’t it be “partners for all,” and not the Internet? My point is that whatever value the Internet provides for impoverished populations is at best a supporting role.

Another trend these days, that I’ve heard in development overall, is to say, when someone argues against a cause, that “it’s not either/or – you can do both!” This is a good answer if you are interviewing for position with the United Nations, but it is plainly ridiculous. There are limited resources in global development, as Jeffrey Sachs is very eager to remind us. If it could always be “both,” what about CAT scans for rural health clinics? What about Mercedes-Benzes for all? The Internet isn’t cheap – the Internet for all means less of something else... and that something less might be the \$10 per year of medical care that would prevent 80% of the illnesses in a village.

A persistent, related myth is to believe that information equals education. But, as our own relationship with MIT Open Courseware shows, the availability of information is not at all the same as a real education. Education additionally requires study and practice, often over months or years, before information is digested into practicable form. Giving children access to the Internet is not, in itself, a guarantee that they will learn anything. (If it was, we could all just leave our children in a room with a connected PC, and

¹ I am singling out the WWW Foundation, but they are just one instance of a much wider phenomenon.

dispense with schools entirely.) The Internet is also full of compelling games that teach nothing. Without a caring teacher to supervise them, what will children prefer: Studying algebra online, or playing Super Mario Brothers?

Rather, what is essential to education is time spent studying the material, applying the material to practical use, and possibly creating new material of one's own. Yes, the Internet could enable all of those things, but it can't enforce all of those things. For that, you need a good teacher or a good parent or a good mentor. Where education is broken, it's broken because teachers are not teaching well, parents are not vested in education, and children aren't doing their work...and very little of that can be changed through technology.

I should make clear – I very much believe everyone should receive a good education; I much prefer governments that make their activities transparent to their citizens; and, I do believe that poor and marginalized people are often lacking information that could change their lives for the better. I also believe that for people who have some minimal education, who have a bank account, who have leisure time, and who have confidence in their ability to learn, the Internet is an incredible source of knowledge that has the potential to enable many great things.

But, if the goal is to enrich the extremely poor and empower the very marginalized, many other things beyond the technology and the Internet also need to exist – good infrastructure, economic slack, decent education, future orientation, social ties to power, etc. Without these other components, information alone is powerless. It's not that information isn't useful, and it's not that information isn't important. It's that information is not the bottleneck.

Going back to you, imagine if you had a physical trainer, a gym membership, friends who exercised with you, and a cook who spares the grease. Even if you didn't know that good diet and moderate exercise were good for you, you'd become healthier by the day. (In fact, recent research suggests that just being connected to a social network of obese people increases one's chances of becoming fat (Tamburlini et al. 2007).) Note, also, that your physical trainer, your friends, or your cook could easily let you in on the secret about good diet and moderate exercise – you don't need the Internet for that.

So, the next time you hear about another government project to bring the Internet to “the masses,” or the next time you're involved in a project to close the “digital divide,” ask yourself this: Who is providing the additional infrastructure, the institutional support, and the funding for all of that, to make meaningful

change happen? And, if infrastructure, institutions, and funding were provided, are we really sure we need the Internet, too?

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Cloud Computing – Is the Indian Government Ready for the Change?

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[Can offices of the Indian Government use the cloud infrastructure? A letter of Ministry of IT which is more than two years old advises against use of foreign servers for hosting Indian government websites. This advisory does not take into account the advent of cloud computing platform but effectively prevents use of cloud computing for all government departments. This article discusses the existing misconceptions about using this technology and difficulties face by government organizations.]

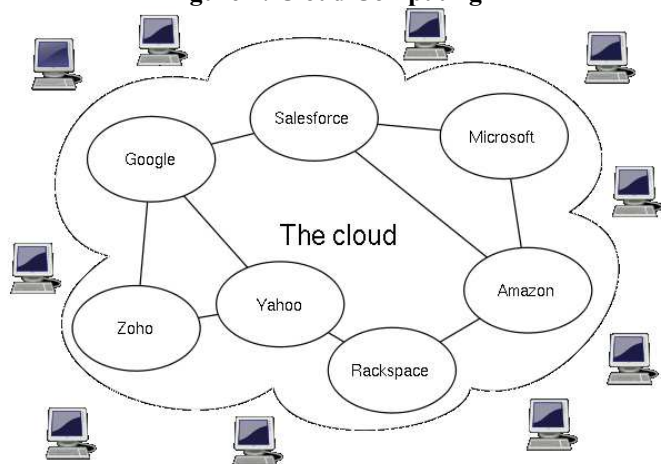
What is Cloud computing?

Cloud computing refers to a pool of abstracted, highly scalable, and managed computer infrastructure capable of hosting end-customer applications and billed by consumption. Cloud computing is very different from the normal N tier architecture of creating servers restricted to a single datacenter. It uses the power of multiple servers functioning from multiple geographic locations around the globe simultaneously optimising on resources based on diversified load distribution, as shown in Figure 1.

In other words it is the “economies of scale” which cause costs to come down drastically. Multiple servers and locations enhance reliability and availability to almost hundred percent of the time. On the other hand, to create and maintain an exclusive system that is this reliable would cost millions. For instance, it is estimated that worldwide only 15% of the capacity of datacenters is used which means that about 85% of the potential is lying idle. Add to this is the high level of obsolescence, prohibitive cost of support infrastructure, and requirement of highly skilled engineers to run the system. An exclusive datacenter is

thus clearly an unviable solution from an economic point of view.

Figure 1: Cloud Computing

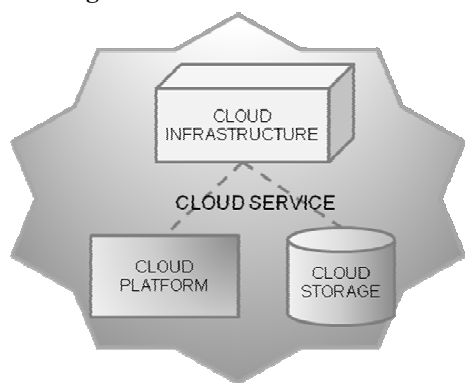


Source: http://en.wikipedia.org/wiki/Cloud_computing

Cloud services are broadly divided into three categories, as shown in Figure 2:

- Infrastructure as a Service (IaaS): Infrastructure services and platforms that are used to deploy cloud applications
- Platform as a Service (PaaS): Application services and platforms that enable cloud applications to be built
- Software as a Service (SaaS): Applications that are made available to customers on demand

Figure 2: Cloud Based Services



In cloud computing it is impossible to specify any one location for the servers. The computing infrastructure of all reputed companies in the cloud computing sphere *spans the whole world and is not restricted to just one country*. Just the way the Internet is not exclusive to any one nation, so is the Internet cloud. It is the technology of the future, focused on sharing and optimizing resources. According to Nicholas Carr, author of “The Big Switch: Rewiring the World from Edison to Google”, the strategic importance of information technology is diminishing as it becomes standardized and less expensive. He argues that the *cloud computing paradigm shift is similar to the displacement of electricity generators by electricity grids early in the 20th century*.

How secure is the Cloud?

Security of data has very little to do with the physical location of the data. The recent hacking of servers of the Ministry of External Affairs, Government of India, located in the safest rooms of North Block is a case which proves beyond doubt that physical location of servers does not provide any extra security. The data is stored in electromagnetic form (binary codes) and transmitted as electromagnetic waves. It has no physical form and thus is practically invisible. Hence ascribing physical protection or boundary makes little meaning. For example, electricity cannot be locked up in a room and the same is applicable to electronic data.

Data security is provided through encryption, firewall and procedures. All of these are covered in standards such as the ISO 27000 series, to which reputed Cloud based solutions comply. The better the firewall and encryption techniques, the higher the level of security. High quality firewall and security systems are prohibitively expensive and hence to create such an exclusive system would be eventually unviable. For example, it is not economically viable to have a firewall of Rs 5 million for an application costing Rs 10 million. Yet, it is possible to have the very best security system if one can optimize on economies of scale. Thus it is seen that private datacenters find it difficult to match the state of the art security offered by reputed cloud service providers for data and applications.

Which is critical to security of data - application or hardware?

This crucial question needs to be answered before we tackle the larger issue of security. The software application is very seldom decoded. For instance, Microsoft has not let out its source code to its customers. Every one knows how Microsoft updates its applications. A subroutine built into the software application throws out data which reaches its destination traveling through many routers and informs the Microsoft server that so and so computer belonging to so and so person located at so and so place is running registered software and is in need of such and such updates. The link is established and communication takes place unhindered. Theoretically it is a Trojan but a good one from the Microsoft point of view. In other words a software application opens up thousands of ports for communicating with the servers located in remotest corners of the world.

Can hardware be a bigger security hazard than this? In fact, the hardware can do nothing on its own and is completely controlled by software. What Microsoft does is also done by others including SAP, Oracle, Norton and all commercially off the shelf applications (COTS). Hence, by this yard stick we will have to ban all COTS solutions too.

What are other countries doing?

We cannot deny the obvious - innovation and change is inevitable for being competitive. Most of the developed countries like USA, Japan and many European governments have adopted cloud computing with little hesitation. They have understood the merit of the new technology and have encouraged their governments to get better value and service. Japan Post is one such government undertaking that uses SaaS on salesforce.com.

Conclusion

Information Technology is ever changing. In the past people have moved from mainframes to desktops and from local data centers to centralized infrastructure. Similarly, in the software sector companies are using ERP in place of bespoke applications. Moving to cloud computing - an integrated, flexible platform is the next big step. The cloud is more reliable, cheaper and fast to implement as it uses economies of scale. New technologies leap frog in geometrical proportion. Policy makers have to be nimble to reap their benefits. History has shown that countries who have adopted newer technologies faster have always controlled the laggards. Let us make a beginning.

The Greenstone Support Network for South Asia

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Abstract

Digital libraries (DL) and in particular, open source DL software, are helping developing countries to manage knowledge and to disseminate information needed for national development. The flexibility, robustness, ease of use, and free availability of the open source Greenstone Digital Library software suite make it a particularly useful resource for a wide range of digital library applications. This paper describes the evolution of a Greenstone Support Network for South Asia to promote the development, adaptation and use of Greenstone in the implementation of digital libraries in this region.

Digital libraries in developing countries: The role of Greenstone

Digital Libraries (DLs) are important for library and

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information services in developing countries as they can help to preserve content and improve access to it, facilitate the creation of local content, and strengthen the information-handling capacity of libraries and a wide range of public, private sector and civil society institutions. An important enabling factor here is the building of collections of information resources in local languages and the availability of software interfaces in the user's language.

The open source [Greenstone Digital Library \(GSDL\) software suite](#), developed by the University of Waikato in New Zealand, is a user-friendly, multi-lingual, multi-platform package for assembling electronic documents into digital collections and for publishing these collections on the Web or on CD-ROM. It accepts documents in a wide range of proprietary and standard formats, supports numerous standards for document and metadata exchange, including compliance with the OAI-PMH (Open Archives Initiative - Protocol for Metadata Harvesting) and Z39.50 information retrieval standards, and readily converts bibliographic databases created under UNESCO's CDS/ISIS package into digital libraries, including the full texts of the referenced documents if available.

Greenstone's flexibility, robustness, ease of use, and free availability make it a particularly useful resource for the development of a wide range of DL applications and for the training of librarians and information specialists in DL concepts. Among the possible DL applications, many examples of which have been brought together on the [New Zealand Digital Library](#) site and in the [examples inventory](#) maintained by the Greenstone team are:

- Library catalogues and full-text digital libraries based on them
- Specialised document collections
- Multimedia collections
- Cultural heritage collections
- Indigenous knowledge
- Archives of different types
- Institutional repositories

Greenstone has its roots in a computer science research programme at the University of Waikato to explore the potential of Internet-based digital libraries, and to develop systems that automatically impose structure on un-catalogued and distributed repositories of information. The objective of this was to enable information consumers to locate what they need and to peruse it at their convenience. Since 2000, the software has been improved and distributed as an international cooperative effort between UNESCO and the HumanInfo NGO in Antwerp, Belgium.

As part of this effort, UNESCO distributes a CD-ROM

with Greenstone fully translated in all six UNESCO languages (Arabic, Chinese, English, French, Russian and Spanish), while the Greenstone user interface has been translated into more than 50 languages. Greenstone user groups have been encouraged on a linguistic basis, and now exist for Arabic, French, Portuguese and Spanish users. Regional support networks have been established in Latin America and in [southern Africa](#) with the support of international donors.

The Greenstone Support Network for South Asia

The South Asian sub-region comprises seven countries: Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Greenstone support for specialists in South Asia began in 2006 through a voluntary initiative led by the Indian Institute of Management Kozhikode (IIMK) with the support of several other centres of excellence. The main support tools have been a [website](#) and a [regional e-discussion list](#) subscribed to by 184 Greenstone users, both hosted by IIMK. In addition, the initiative has promoted about 30 Greenstone training workshops, two of which were sponsored by UNESCO.

Although open to all countries and specialists of the region, the support effort was reaching mainly those in India. To provide more balanced access and participation, international assistance was requested in 2008 to help launch a self-sustaining Greenstone Support Network in the region, where DL projects have been difficult to initiate, not only because of a lack of training and technical expertise, but also because of such factors as insufficient project management skills, inadequate funding and infrastructure, lack of knowledge in copyright issues and digital rights management, and poor documentation.

The approach proposed was to apply the proven concepts of best practice in development cooperation: participatory action, attention to user needs, cascade/leverage effect, training of trainers, scalability and sustainability, taking account of the important “soft” or non-technical constraints mentioned above as well as software support.

In December 2008, a contract was established by [eIFL.net](#)¹ with the Sarada Ranganathan Endowment for Library Science (SRELS) in Bangalore to support the launching of the Greenstone Support Network for South Asia. SRELS decided to concentrate on support for the Kannada and Tamil languages as models for the other South Asian languages, and has completed the

¹ eIFL.net is a not for profit organisation that supports and advocates for the wide availability of electronic resources by library users in transitional and developing countries.

interfaces for both users and collection builders in these languages. A unique feature of the Tamil version is the online Tamil-English dictionary of important terms used in Greenstone to assist in building digital collections. A test collection of Tamil literary devices has been developed and is available on line through the New Zealand Digital Library, while a test collection and a dictionary in Kannada are under development. Basic or full user interfaces now exist for eleven South Asian languages - Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Nepali, Singhalese, Tamil, Telugu and Urdu. These interfaces along with technical support details are available on the network support site.

Nepal develops the first national Greenstone support network

[HealthNet](#) in Nepal has been given modest financial support by the University of Waikato to help it to establish the national Greenstone support node and network. A digital library consortium of 12 institutions has been brought together to form the network, and will be registered as an NGO according to government rules. A [network portal](#) for the sharing of Nepalese library resources and presentation of customization issues, training courses and other aspects of open access to knowledge was launched at the end of 2009. The consortium has already made five Greenstone collections available online in English and has completed the Greenstone user interface in Nepali.

The broad objective of the consortium is to have Nepal adopt free and Open Source Software (FOSS) methods, forming a national ‘community’ which can contribute to development, diffusion and sustenance of FOSS techniques in information work. Library automation through the use of ILS software is a critical component of this process.

Nepal connected to the Internet in the second half of 1990s, and the web has since become a platform to add Nepalese content to the global information space. Ease of use and cost factors play a vital role in deciding to adopt a software package. Greenstone, being an open source and web-based package, has the potential for to support a web-based digital library system.

In adopting a digital library system, sustainability has to be planned from the very beginning, and factors such as customisation, training and sharing of resources have to be taken into consideration. Therefore, consortium members are charged a small, annual subscription fee, in return for which the members get support service, customization of software, and web hosting of their databases.

Key components of the Greenstone customisation effort in Nepal have been the integration of Greenstone

and [Koha](#)¹ to enable easy access to available full-text documents corresponding to library catalogue entries, and the section tagging method to enable the user to go directly to the particular document chapter that he needs, which saves download bandwidth use in addition to providing a better service. Work is ongoing with the Greenstone team on improve these features of the software in the light of the Nepal experience.

The Greenstone user survey in South Asia

A user survey² using web-based questionnaires was conducted in September-October 2009 among members of the Greenstone support programme in the South Asia discussion list and other professional lists, and known users. Separate questionnaires were provided for individuals and for institutions. Among the 64 respondents, 42 were individuals and 22 were institutions. In total there were 59 responses from India, three from Pakistan, and one each from Nepal and Sri Lanka.

The survey has provided a lot of information on digital library activity and infrastructure in the region as well as on users' views on Greenstone and on Greenstone support efforts. Some of the interesting results are summarised here.

Respondents felt that support for digital library initiatives/ projects is needed primarily for preservation, software acquisition, maintenance and development, maintaining digital library portals, and for making indigenous knowledge systems online, with the last being especially highly rated by the institutional respondents.

The most frequently cited challenges in creation and use of digital libraries are human resources, expertise/ capacity building, budget and hardware/ technical support. The last, along with host facilities/ connectivity and support of management, which were cited by 5% of the individual respondents, are somewhat predictably relatively less important for institutions.

64% of the respondents are neophyte users of

¹ Koha is a full-featured open-source ILS maintained by a team of software providers and library technology staff from around the globe.

² Although the initial survey has been completed, specialists and institutions in South Asia can still participate in the survey by completing the questionnaire at <http://dharmaganja.ncsi.iisc.ernet.in/survey/>; those who wish to see the questionnaire without participating in the survey can view the individual pages, e.g. for page 2, can access it at: <http://dharmaganja.ncsi.iisc.ernet.in/greenstone/greenstone2.php>

Greenstone. The second most frequent category (20%) is that of very experienced users (with more than 2 years experience), while the remainder have used Greenstone for between six months and two years. Eight respondents (25%) have used the multilingual facilities in South Asian languages.

77% of the respondents thought that a South Asian - based support organization for digital library initiatives/ projects is needed, while 3% thought not and 13% had no opinion.

Respondents were asked to select an appropriate model for a South Asian-based support organization for digital library initiatives/ projects. This question was not included in the institutional questionnaire. Although there may be some ambiguity in the replies due to the fact that the choices were not strictly mutually exclusive, 60 % of the respondents were evenly split between country-based governance or sponsorship by a professional body or NGO while direct user representation or a governing committee were favoured by only 21%, with the remainder having no opinion.

Concerning how to ensure sustainability of the network, the model of cooperative participation in kind was clearly preferred (34%), while an equivalent number were split between the options of charging fees for specific services or for membership, and a smaller number (11%) favoured sponsorship by an existing professional organisation. The responding institutions, as opposed to the individuals, are apparently very leery about paying membership fees.

Training and consultancy are the services for which respondents are most ready to pay (respectively 27% and 20% indicated this), but consultancy is relatively less favoured by institutions. On the other hand, and logically, institutions seem more ready to pay for software development support than the individuals.

The results of the survey generally support the initial hypotheses concerning the need for a South Asian Greenstone Support Network and for the approach of building it through the strengthening of national level activities and the gradual extension of sharing and support activities by a growing pool of centres of excellence. The survey has also provided a useful benchmark for digital library development in the region, and a very useful resource for planning and targeting Greenstone support activities.

The way forward

The biggest challenge is to develop a spirit of networking and sharing at the national and South Asian levels, in cultures which traditionally have been used to defining responsibilities in hierarchical terms.

A corollary challenge is the adoption of a system of network governance which delegates responsibilities for cooperative activities. Progress has been made through the strong involvement of several institutions, particularly in India and Nepal, but this progress has been uneven and needs to be consolidated through greater broader and deeper modes of cooperation.

The new Greenstone collections of the region will be inventoried and promoted on the project website, new members and partners solicited, and the further development of South Asian language interfaces encouraged. If at least two new nodes agree to join the regional support network, the network will be formally established with three initial nodes within the current phase of the project. A phase 2 proposal for international funding will be developed in mid-2010, aiming to consolidate and extend and ensure sustainability of the network in terms of membership, capacity building and operational information services for development. Readers who are interested in joining in the Greenstone support activity in the region are invited to contact the authors.

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ICTs and Agricultural Supply Chains Opportunities and Strategies for Successful Implementation

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Abstract

Indian agriculture has the potential to dominate the global markets provided post-harvest losses are minimized and the link between farmers and other stakeholders can be established through ICTs. This article describes the opportunities and challenges of agricultural supply chains in India, and explores how ICTs can facilitate the building of linkages between farmers and markets thereby increasing efficiency across supply chains. In addition, this article discusses the critical success factors (CSFs) which shall drive the ICT revolution in Indian farming.

Introduction

Information Technology has revolutionized the farmers across rural areas all over the world. ICTs (Information & Communication technology) can also do wonders in empowering small and marginal farmers of developing countries, who have poor access to information, especially regarding customers and markets. In developing countries, the limiting factors for farmers wanting to maximize their farm incomes are poor market linkages, poor access to quality farm-inputs, services and technology, lack of information about Government resources, institutions and extension services. The farmers also lack real time information about consumers, market demand and prices and hence are prone to more exploitation by existing intermediaries in the supply chain. With the growth of organized retailing and free global trade, farming is becoming highly knowledge intensive, commercialized, competitive and globalised, making it necessary to rebuild competitive and efficient agri-supply chains to benefit both the farmer as well as the consumer.

Agricultural Supply Chains in India

Agricultural supply chains involve both backward as well as forward linkages among all the stakeholders i.e. input companies, government institutions, market intermediaries, consumers and farmers. At the back end of the supply chain are private sector and public sector companies that manufacture, trade and export inputs like seeds, pesticides, fertilizers, farm machinery, etc. for the farmers' use. Information is also counted as an important input these days. Farmers need to have information on farming practices, weather, sowing and harvesting time, pest management, fertilizer use, etc. Farmers need information on new products and brands launched by these companies. Information is the most important input which can ensure the availability of all other required inputs at the right place and right time. Presently, due to the lack of proper information on inputs, advisory services, and weather and climate information services, farmers are unable to align the quality and price of their products to the market standards.

Marketing of agricultural products in India takes place through agricultural *mandis*, which are regulated by the [Agricultural Produce Marketing Committee Act](#) (APMC Act). The produce is brought to these mandis by farmers, where a long chain of intermediaries is involved. The price of the commodity is decided through behind-the-scene auctions by the *aartiyas*¹

¹ Aartiya is the common name for traditional middlemen in the agricultural marketing system in India, who procure agricultural produce from farmers and charge commission. They make the maximum margin in the value chain, but add very little value to it.

who function as intermediaries. During the peak season, the farmer sometimes has to wait for many days to get his produce unloaded. These mandis lack basic marketing infrastructure such as grading, standardization and storage facilities. In the process, the quality of the produce deteriorates. It has been found that post harvest losses in mandis occur primarily due to lack of marketing infrastructure and storage facilities. After the produce gets unloaded, the farmer is at the mercy of the aartiyas, as they are the ones who decide the price of their produce. The farmer has to sell at whatever price is decided by these intermediaries. There is a lack of transparent weighing facilities in the mandis. All these constraints lead to inefficiencies in the value chain and result in a very small monetary share for the farmer. The efficiency of a supply chain depends upon the extent to which both our backward as well as forward linkages are integrated with all the functions in the supply chain so that all the stakeholders involved are benefitted.

To reap the benefits of the existing opportunities, there is a need to circumvent the agri supply chains by removing the inefficiencies in the marketing system. Government is taking steps to improve the system in the country by permitting contract farming and direct procurement from farmers through amendments of the APMC Act. Several schemes have been launched such as the marketing infrastructure scheme,¹ [Rural Godown scheme](#)² and [AGMARKNET](#)³ to empower the farmers. Besides Government efforts, corporate giants, which have entered into food retailing are also investing in supply chain and are trying to build up information network to facilitate the agricultural marketing trade in the country.

ICT and Indian Agri-Supply Chains

Innovations in ICT are helping to bridging the gap in the agri supply chain and offering a communication platform to link farmers to the markets. Both computer-based as well as mobile-based models have been adopted to spread the information in these countries. [E-choupal](#),⁴ Warana, Grameen Sanchar

¹ Marketing infrastructure scheme is promoted by the Ministry of Agriculture for the development of agricultural marketing infrastructure in the country though financing of infrastructure projects. For more information, see www.agricoop.nic.in

² Rural Godown scheme is a financing scheme promoted by the Ministry of Agriculture to facilitate construction of storage facilities in rural areas to avoid post-harvest losses.

³ AGMARKNET is an agricultural marketing information network of the Ministry of Agriculture through which all agricultural markets are connected through a portal.

⁴ ITC's e-choupal has leveraged ICTs to deliver real-time information and customized knowledge to improve farmers' decision making ability so that they can align farm output with market demands, improve their productivity, aggregate demand like a virtual producers' cooperative, and access

Society ([Grasso](#)), [Reuters Market Light](#), [AGMARKNET](#) and [Lifelines](#) are a few successful examples. Amongst the promoters are public sector, not-for-profit sector and private sector companies who are targeting the major stakeholder i.e. the farmer, with their unique information delivery systems.

Mobile companies are also targeting rural areas with their specific products and services. The [Nokia Life Tools project](#) is one such example along with the [Airtel](#) and [Reuters Market Light](#) project, both of which are marketing commodity-specific information packages to farmers. As many public sector and private sector models are being tried in an effort to link the farmers to markets, it becomes important to study these communication packages as a bundle of benefits to the farmers and other stakeholders. However, the success of these models depends on how effectively and efficiently farmers are able to make use of these technologies.

Opportunities of Information Delivery

A strong need has been felt regarding the informational needs of the farmers throughout agricultural value chain. (Table1). The farmer lacks information regarding mandis, commodity prices at various mandis thus delinking him from markets and consumers and making him prone to exploitation in the hands of intermediaries. Information is needed by farmers at every stage, right from sowing the seeds to selling his produce in the mandis. Farmers lack awareness about domestic/international markets as well as alternative market channels. They must have information about what varieties are preferred by the consumers and how the agricultural as well as post harvest management practices can be employed in order to fetch better prices for their produce. They also need information on Government schemes and funds available to them for adopting new technologies/processes. Besides the needs to obtain information, farmers also have an inherent desire to interact with various peers and experts in order to discuss problems related to agriculture. This can be possible only when they are connected through an informational network specifically designed according to their needs. For a company marketing information through internet as well mobiles, there are a lot of opportunities existing at both the ends.

Table 1: Informational Needs of Farmers

Pre-sowing	Pre-harvest	Post-harvest	Market Information
▪ Information on agri	▪ Good agricultur	▪ Post harvest management	▪ Alternative market

high quality farm inputs at lower costs. The model works at providing information on market prices in various mandis and at ITC procurement centres, allowing the farmers to take decision on where they want to sell their produce.

Pre-sowing	Pre-harvest	Post-harvest	Market Information
<ul style="list-style-type: none"> inputs such as seeds, fertilizers, pesticides ▪ Credit ▪ Weather ▪ Soil testing 	<ul style="list-style-type: none"> al practices, pest management ▪ Time and techniques of harvesting ▪ Packaging 	<ul style="list-style-type: none"> ▪ Storage ▪ Grading and standardization ▪ Logistics ▪ Market Information 	<ul style="list-style-type: none"> channels, commodity prices ▪ Mandi information ▪ Consumer behavior

Critical Success Factors for Implementation of ICT Projects

Despite the efforts of the information delivering agencies, these projects have a long way to go because of the challenges being faced at implementation level. These challenges are mainly related to three areas as shown in Table 2.

Table 2: Critical Success Factors for ICT-Based Information Delivery

Institutional	Infrastructural/Operational	End-user level
<ul style="list-style-type: none"> ▪ Revenue-cost ▪ Sustainability ▪ Collaborations ▪ Technology ▪ Leadership 	<ul style="list-style-type: none"> ▪ Technology ▪ Electricity availability ▪ Power-backup ▪ Connectivity ▪ Capacity building of stakeholders ▪ Information collection, validation and dissemination 	<ul style="list-style-type: none"> ▪ Product-service mix ▪ User-friendly technologies/operations ▪ User training ▪ Need identification for information delivery ▪ Mode of delivery ▪ Value-added services ▪ Awareness

Revenue-cost stream

Most of the Government funded IT initiatives provide free of cost information to the farmers whereas some recently launched mobile based services such as Reuters Market Light, Nokia Life Tools and [Handygo](#) run on business models that involve payment of subscription charges. There have been arguments earlier about whether farmers are willing to pay for services or not. Experiments done by these companies have shown that farmers are willing to pay for these provided they get the right information at the right place and time.¹ However, the need and quality of service delivery is very important for paid services. Economies of scale are also important for sustainability of such initiatives. For any kind of ICT

¹ Source: <http://www.watblog.com/2009/11/18/exclusive-interview-with-amit-mehra-md-reuters-market-light-enlightening-farmers/>

model to be successful, it is necessary to generate a parallel revenue stream as has been tried by e-choupal. To start with, Government funded projects get a head start, but after some time the sustainability of these projects has to be ensured through alternative income sources such as content selling through input companies or paid services.

Infrastructural constraints

ICT initiatives typically require infrastructure in terms of hardware, connectivity, electricity availability and internet availability. In a remote village, irregular or no electricity supply, absence of fixed telephone lines, inadequate bandwidth, etc. may limit the possibility of running an IT kiosk successfully. Therefore, it is essential to ensure availability of proper infrastructure in these areas. Public private partnership could be one way of ensuring the availability of basic as well as specialized infrastructure.

Need based quality informational inputs

It has been seen in various cases that farmers only value need-based quality information. A generalised content in these cases might not help as farmers in different regions need different kinds of information. Also, the informational needs are crop-specific as well as time-specific. The farmers are also willing to pay for these services if they help them enhance value of their output in both production as well as market terms. Issues such as what information farmers need and when need to be considered carefully. Some of the other important considerations for delivering information to farmers are indicated in Table 3.

Table 3: Delivering Information to Farmers: Need of the Hour

From	To
Generic	→ Localized specific information (commodity-specific)
Traditional media	→ Modern media
Information clutter	→ SMART information
Information supply	→ Demand driven information
Free of cost information	→ Value added premium services
Single supplier	→ Collaborative business modules
Text services	→ Multimedia supported information

Mode of delivery

The mode of delivery of information to farmers and other rural folk is very important. The ease of delivery of information with respect to language, dissemination and readability should also be ensured in order to make these initiatives useful as well as popular. Quite recently, there has been a debate on which is the better medium of communication for information delivery. - the Internet or the mobile? An Internet based kiosk ensures that a large number of beneficiaries benefit from the same kiosk and also have an added advantage

of multimedia and interactive communication. On the other hand, mobiles can deliver more personalised and customised information.

Nokia Life Tools and Reuters Market Light are SMS (Short Message Service) based services through which farmers get information on sowing time, weather conditions and pest management practices from time to time. On the other hand, Handygo services are based on voice based interactive systems.

Commitment of stakeholders

The success of these projects requires strong commitment of all stakeholders. In the case of the public sector model, the state agricultural marketing boards, local district authorities and extension officials need to work with local agencies for data collection, validation and delivery of service to the farmer. These initiatives are launched because of push from higher authorities, but sometimes they suffer in the hands of implementers because of lack of interest. Therefore, commitment of the local staff is important to generate interest and awareness among local user communities.

Selection and capacity building

Capacity building of kiosk operators and other people involved is also very important. In the case of IT kiosks, the kiosk operators need to be capable of handling both the operational and technical aspects of IT. Selection of kiosk operators is important so as to pick the most suitable and committed people from the local community itself. Such a person would be able to win the support of the local people. The capacity building of the support staff is also important from time to time in order to build their awareness, generate interest, and to keep them motivated.

Awareness and communication

Adequate awareness of exiting initiatives has emerged as one of the important challenges in this area as many a times people living in the same area are not aware about IT kiosks or other services available. The information providers have to ensure awareness among targeted beneficiaries and users for their proper usage. Farmers and supply chain partners must be made aware about the services available for their proper use. Awareness campaigns, farmer *melas*, pamphlets, brochures etc. help in generating awareness about relevant websites and services available.

Conclusion and Policy Implications

Information technologies can be the best way for farmers to update themselves on information related to agri-inputs, credit, markets, weather, extension advisory and other e-governance services, etc. Both mobile as well as Internet based models can gain popularity among farmer folk as each of these offer advantages. Internet can provide a range of services through an interactive, web-based interface and

multimedia to a large number of beneficiaries at a minimal cost; however Internet connectivity, electricity availability and capacity building are some of the challenges before it. On the other hand, mobiles are capable of providing customized services and ensure speedy and timely delivery of information. Hence the challenge is to be able to use both types of communication technologies depending on region, crop, type of infrastructure availability, and cost of infrastructure development. In order to empower farmers through ICTs, there is a need to first have infrastructural and operational modules, a user friendly mode of delivery and the right product-service mix. However, the most important strategic issue before these models is how these can be made sustainable on their own. Whether to charge farmers or have alternate source of income generation for sustainability remains the important question? Whether farmers are willing to pay and for what services also needs to be answered through further research studies in this area.

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Research on Information and Communication Technology in Thailand

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The Information Technology Research Laboratory (ITRL) was established at the Faculty of Science and Technology of Assumption University in Thailand in 2003. One of the laboratory's research themes is concerned with the adoption of information and communication technologies (ICT) among organizational sectors and individuals and the development of the ICT profession in Thailand. The research has a direct relationship with the evaluation of the nation's progress toward the achievement of national ICT policies and objectives aimed at the development of a knowledge-based society.

The research projects undertaken by ITRL are designed to explore, describe, formulate, and test theoretical models and frameworks concerned with the adoption of ICT from the perspective of individual and organizational users, developers, ICT professionals, and the broader societal setting. The research projects have theoretical and practical outcomes and adopt positivist and interpretive research methodologies and quantitative and qualitative methods. The research outputs are targeted for international and national audiences with an interest in ICT in the developing nation of Thailand.

Studies completed to date have focused on: the present and future ICT requirements of organizational sectors; the knowledge and skills required of ICT professionals; the adoption of different ICT sourcing strategies; the problem of turnover among ICT professionals; and the adoption of Internet banking technologies in Thailand. Projects being undertaken currently are studying the factors affecting: the implementation of DSS and ERP systems in Thai organizations; the success of ICT project management in Thailand; information overload in organizations in Thailand; the use of Internet gaming among youth in Thailand; the adoption and use of professional Internet

based forums; and the use of social networking technologies in the context of viral marketing. In addition, a study is being conducted in conjunction with researchers from the University of Wollongong in Australia to compare the nature and structure of the ICT profession in Thailand and Vietnam.

Further information regarding these research studies may be obtained by contacting the author.

Conference Announcements

International Conference on ICT for Africa (ICIA 2010)

March 25-28, 2010, Yaounde, Cameroon

The theme of the International Conference on ICT for Africa 2010 (ICIA 2010) is '**ICT for Development – Contributions of the South**'. The four-day convention will bring together a fine mix of practitioners and academicians in the area of ICTs for sustainable development. It will explore the contributions of Africa to the global ICT for development discourse and efforts. The objective is to highlight the synergy of collaboration between African countries and other developing countries, and between African countries and the developed countries towards development solutions.

Discussions and panel debates will therefore question how ICTs become the process for South-to-South knowledge transfer and South-to-North knowledge transfer in both research and practice. Workshops will explore international grant seeking opportunities for ICT research and projects, e-learning for African universities, and new frontiers in telemedicine and tele-neonatology research and practice in Africa. Topics that will be covered include the use of ICTs in education, health care delivery, business, poverty and the sustainability of related projects and initiatives in the Sub-Saharan African context. Please visit the conference website at <http://ictforafrica.org/> to know more about the registration procedure.

6th International Conference on E-government

September 30 - October 1, 2010, Cape Town, South Africa

The International Conference on e-Government (ICEG-2010) invites researchers, practitioners and academics to present their research findings, work in progress, case studies and conceptual advances in areas of work from all aspects of eGovernment. The conference brings together varied groups of people with different perspectives, experiences and knowledge in one location. It aims to help practitioners find ways of putting research into practice and researchers to gain an understanding of real-world

problems, needs and aspirations. For further details, please see the conference website at <http://www.academic-conferences.org/iceg/iceg2010/iceg10-home.htm>.

2nd International Conference on Mobile Communication Technology for Development (M4D 2010)

November 2010, Kampala, Uganda

M4D2010 is the second international conference on Mobile Communication Technology for Development after the [inaugural conference](#) in Karlstad, Sweden in 2008 and the [M4D conference](#) in East Africa in 2008. M4D2010 aims to provide a forum for researchers, practitioners and all those with interest in the use of Mobile Communication Technology for Development. M4D2010 will combine two days of plenary peer-reviewed paper sessions, with two days of workshops, panel sessions, discussion forums and demos.

Important dates:

Submission deadline: July 1, 2010

Acceptance note: August 31, 2010

Final papers due: September 30, 2010

For more information about the conference, please visit: <http://m4d.humanit.org/>

Editorial

(continued from page 1)

Some infrastructure like data centers, State Wide Area LANs and Citizen Service Centers have been established but there is no sign of online delivery of services. Very little is understood about organizational mechanisms that are required for coordinating the work of several agencies in the execution of a large program. The coordination agency needs to ensure that projects are designed to deliver significant benefits to all stakeholders, funding mechanisms are such that resources are not wasted, implementation adheres to identified best practices, and monitoring and evaluation ensure that time lines are adhered to without compromising the outcomes.

The ultimate test of a good national program, however, is that design and implementation processes are streamlined so that projects can be scaled up and replicated, but at the same time, innovation that seeks to harness the ever growing power of ICTs is not stifled. I see a glaring example of how innovation can be killed under the burden of a planned approach. In one of my [recent editorials](#), I had written about Zero Mass Foundation's (ZMF) solution for pension payments in Andhra Pradesh using mobile technology. I recently had a meeting with the team from [A Little](#)

[World \(ALW\)](#) and ZMF that has built and implemented the application. I was disheartened to learn that the project may not survive. A number of stakeholders admire the work done by ZMF but no one is willing to reimburse the processing cost of Rs 5 per transaction – a fee that is most reasonable in comparison to Rs 13 reimbursed for a less complex service offered through Internet kiosks. There is either bureaucratic apathy in the lack of support for the innovation or protection of a vested interest because the ZMF solution is in direct competition with Internet kiosks – an approach to which the NeGP has made a strong commitment.

However, this setback has not diminished the enthusiasm of the team. They continue to innovate, churning out a miniature pocket-sized set top box for video reception, a miniature projection system that can produce a clear 5 ft by 5ft image in a dark room, a light that is sufficient to brighten a room and can be operated for five hours daily for a month at a cost of just Rs 30, and a mobile phone with a special SIM card that can retrieve information from remote databases on the press of a single key and read that information aloud. Perhaps what keeps them going is the recognition that they have received from external agencies. For instance, ALW was recently named as one of the top ten innovative companies in India along with giants such as Infosys, Wipro and Bharti Airtel (Source: <http://www.fastcompany.com/mic/2010/industry/most-innovative-india-companies>).

The IFIP WG 9.4 Newsletter Website

The [Information Technology in Developing Countries](#) Newsletter has been published by Prof. Subhash Bhatnagar (Founding Chairman of IFIP WG 9.4) through the support of various agencies such as IDRC and COMNET-IT in the past. Since 1999, the Newsletter has been published as a joint publication of IFIP WG 9.4 and the [Centre for E-Governance](#) (CEG), Indian Institute of Management, Ahmedabad (IIMA).

A legacy of 10 years of print circulation to its credit, this newsletter has been published on the web for more than a decade.

The next issue of the newsletter will be published in June 2010. For archives, subscription details and guidelines for contributions, please visit the Newsletter website: <http://www.iimahd.ernet.in/egov/ifip/wg.htm>