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How Can Information and Communication Technology Bring about Development? An Information Architecture for Guiding Interventions in Developing Regions

Mehruz Kamal
University of Nebraska at Omaha

Sajda Qureshi
University of Nebraska at Omaha, squreshi@unomaha.edu

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Mehruz Kamal
University of Nebraska at Omaha
mkamal@ist.unomaha.edu

Sajda Qureshi
University of Nebraska at Omaha
squreshi@ist.unomaha.edu

ABSTRACT

While a great deal is known about how Information and Communication Technologies are used in developing and under-served communities, there are still gaps as to how ICTs may enable development outcomes to be achieved. It appears that the majority of businesses in developing regions are micro-enterprises which employ between 1-5 people and face challenges of limited resources. This research investigates what is known about how ICTs bring about development and uses these insights to develop an information architecture adapted from the Zachman Framework that integrates the different perspectives. In this research, the key stakeholders are the micro-entrepreneurs who adopt technology to support their businesses and livelihoods. We selected this type of business because the majority of businesses in developing regions are micro-enterprises and their ability to survive greatly increases when they learn to adopt ICTs. However, the challenges are many and their ability to adopt technology depends upon the social, human and economic conditions in which they find themselves. The information architecture proposed in this research considers these challenges and enables appropriate ICTs interventions to be applied. The contribution of this paper is in an information architecture through which development strategies may be implemented.

Keywords

Development, Economic, Social, Human, Information Architecture, Zachman Framework, Interventions.

INTRODUCTION

Current research has shown that through the use of information and communications technologies (ICTs), small and micro-enterprises are able to see improved economic outcomes - thus increasing their potential for survival within developing communities. Micro-enterprises play a very important role in generating jobs, developing business skills, and providing needed goods and services to a community (Duncombe and Heeks, 2002; Daniels, 1999). Barriers to starting these enterprises are generally high as households or individuals may engage in more than one micro enterprise, or may use one to augment or temporarily replace wage salaries. It is seen that most developing countries are predominantly comprised of micro-enterprises. Even within developed nations such as the United States, micro-enterprises comprise 87% of all businesses in the country. Current research has investigated the effect of ICTs on Human, social and economic development. Human development is seen to be a key determinant of successful ICT adoption in developing regions. This concept according to (Sen, 1999) suggests that people need to be in control of their lives in order to take the opportunities presented to them. Authors of past research suggest that human development entails access to services such as healthcare, education and governance (Ezer, 2006, Jacucci et al., 2006, Musa, 2006, Reinhard and Macadar, 2006, Sahay and Walsham, 2006). The research on social development suggests that implementations of technology in eGovernment (Ciborra and Navarra, 2005, Krishna and Walsham, 2005, Shaomin, 2005, Ulrich and Chacko, 2005), healthcare (Chilundo and Sahay, 2005, Kimaro and Nhampossa, 2005, LuÃs Mosse and Byrne, 2005, Mosse and Sahay, 2005), education (Furuholt and Ã˜rvik, 2006) and the environment have had the effect of bringing about better lives for people in underserved communities. Economic development perspectives measure growth in terms of income generation, job creation, and/or reduction in poverty (Waverman et al. 2005; Roller and Waverman 2001; Abraham 2007). While these numbers are used in making policy decisions, they often overlook the informal sector where most of the micro-enterprises operate. They do not represent the extent to which actual development (or the lack there of) is taking place within the most underserved communities.

This research suggests that while human, social and economic development perspectives are important and ICT adoption has the potential to enable those outcomes to be achieved, little has been done to find the connections between these concepts (CÃ¢mara et al., 2006, Davis Jr and Fonseca, 2006, Lance and BassolÃ©, 2006, Puri, 2006). Those researchers make an effort in this direction by bringing to light the different perspectives that are being used in implementing IT for spatial data infrastructures. This paper suggests that when ICT implementations address all three issues, they increase the chances of success of those implementations, particularly with regard to micro-enterprises. Small and medium sized businesses that have

adopted and used ICTs have seen positive outcomes related to operational efficiencies, increased revenues, and are able to better position themselves within their market niche. Qiang et al. (2006) observed that businesses that utilized e-mail to communicate with their customers experienced sales growth 3.4 per cent greater than those which did not. Similar outcomes were also observed for productivity and reinvestment. Both these components were found to be greater for more intensive users of IT (Qiang et al., 2006). Other research in this area also highlights the positive impact of IT use within small businesses. A 4% increase in sales as well as 5% increase in export performance was obtained when e-business techniques were adopted by SMEs in the manufacturing sector in Canada (Raymond *et al.,* 2005). Specifically, Raymond et al. (2005) mention that by using technologies such as websites, email and telephones to communicate with customers, SMEs can provide better customer service as well as expand their customer base to help reach out to both local as well as international consumers for their products. In another study Southwood (2004) found that ICT investments by SMEs in South Africa resulted in profitability gains from cost savings rather than from increase in sales.

We focus on microenterprises because these are the most predominant form of business in developing regions and the ones that are most likely to fail. When they do adopt IT their potential to survive and grow increases. However, the adoption of IT is dependent upon a combination of economic, social and human factors, all three of which are very limited. Microenterprises often have very little money to purchase equipment or access IT. They do not have the education or training to be able to use IT when they do have access to it, or even sufficient support services. We contend that the most important factor is the ability of the micro-entrepreneur to feel in control of their lives (Sen 1999; Conger and Kanungo, 1998; Bandura 1977). The question being investigated in this paper is: How can all three development factors come together to enable micro-enterprises to grow? This question is investigated through review of research addressing economic, social and human development through ICTs. And in particular in the case of micro and small firms, the extent to which ICTs enable their growth. The findings enable the development of an Information Architecture for micro-enterprises in developing regions that shed light on issues that need to be considered for IT interventions to impact economic, human, and social perspectives of development in that context. Following an analysis of these results, this paper also provides recommendations for the use of ICTs to enable growth of micro-enterprises.

METHODOLOGY

This study utilizes a bottom-up inductive design process to building an Information Systems Architecture for micro-enterprises in underserved regions. Haverty (2002) explain how the design process of information architecture is inductive for two reasons: 1. Information architecture does not have internal theory to guide top-down design and, therefore, must proceed by bottom-up, or inductive design; 2. Information architectures support the emergent phenomena of user experiences, and until we better understand how to study and design for emergent phenomena, they will require bottom-up designs. The inductive nature of information architecture is best explained by Constructive Induction (CI) which is a process for producing a design solution using two intertwined searches. The first search involves identifying the most adequate representation framework for the problem; the second search involves locating the best design solution within the framework and translating it to the problem at hand (Arciszewski, Michalski, & Wnek, 1995; Bloedorn & Michalski, 1998).

For the context of this study, the design problem is, how can ICTs bring about development in developing regions? In addressing this problem, the first search of the Constructive Induction process involves finding an adequate representation framework that would help us understand the issues involved as we talk about how technology may impact economic, social, and human development. It is important to note that although there has been research done in the area of IT for Development, there is no comprehensive framework that provides a thorough view of the different perspectives of development and how IT impacts them. Therefore, our first task was to develop such a representational framework. This was done through an extensive literature search. Such techniques have been widely used in many disciplines including the field of Information Systems (Alavi and Carlson, 1992; Barki et al. 1988; Orlikowski et al. 1991; Van Horn 1973). The results of the literature search resulted in a representation framework of ICT effects on development (table 1) which is outlined in more detail in the results section.

The next step in the Constructive Induction process is to locate the best design solution within our representation framework of ICT effects on development and translate it to the problem at hand. Subsequently, the insights obtained from the literature review are used to develop an information systems architecture based on the principles put forward by Klein and Myers (1999). *The Principle of Contextualization* is addressed by translating what we know about how ICTs impact economic, social, and human development to the context of micro-enterprises in developing regions to help guide IT interventions. In developing the theoretical contributions of this research through the information systems architecture, *the Principle of Abstraction and Generalization* guided our use of the literature which was used to provide a systematic means for understanding the key issues facing micro-enterprises and their challenges to growth. The resulting information systems

architecture is an adapted version of the Zachman framework (Zachman, 1999) that provides an organized and descriptive representation of micro-enterprises in underserved regions to help guide IT interventions in that context.

RESULTS: THE REPRESENTATION FRAMEWORK

A Framework for ICT Effects on Development

In this section we bring together current research on economic social and human development in order to develop a coherent framework. While the theoretical contributions of economic social and human development appear to be studied separately, they are in fact interrelated. It is clear that when these concepts come together, they can be used to help implement ICTs more effectively. Consequently, appropriate ICT interventions may impact economic outcomes – through administrative efficiencies, sales growth, increased productivity, and access to larger markets; social outcomes by leveraging social networks and finally human development outcomes through empowerment. Research has shown that social networks and communities play a critical role in supporting microenterprises (Vargas 2000). Yet there has been little systematic investigation into how the characteristics of different communities support or undermine the impact of interventions. Also, most research has been conducted on a national, rather than a community level. It then appears that there is an absence of any framework or lens that an investigator might use to explore and/or leverage existing social networks in pursuing appropriate ICT interventions.

We provide such a lens in the following framework in table 1, in which we illustrate the key themes that emerged from the analysis of the literature. The results obtained from categorizing the papers that were obtained from the citation as well as the keyword search process are given in table 1. Table 1 represents a classification framework for the literature search that was performed. Table 1 is organized based on the category of development i.e. whether the specific article addresses economic or social or human development. The next column presents the themes that emerged from the categorizations of the papers. The themes of the articles were identified by two researchers and connected to the themes relating to economic, social or human development. For example, in one article the connection between economic development and competitiveness of small firms through IT was made and so this then became the theme that was extracted form that article. The authors of the articles are presented in the last column. We found that these categories are not mutually exclusive but that there are papers that fall into more than one category.

Category	ICT effect on Development Themes	Author
Economic	• Technology improves productivity by improving service and raising ceiling on business expansion. • ICTs increase profitability. • Entrepreneurship enables ICTs to be taken up. • Successful technology transfer requires appropriate business model for small business entrepreneurs. • Basic IT infrastructure is needed for economic growth. • Technology allows access to markets, and administrative efficiencies.	• Schumpeter(2002); Qiang et al.(2006); • Raymond et al.(2005);Southwood(2004); Bladin(2007); • Matthews(2007); • Brown and Lockett(2004);Pateli & Giaglis(2004); • Roller and Waverman(2001);Waverman et al.(2005); Abraham(2007); Avgerou(1998) • Qureshi (2005)
Social	• Reliance on social networks to provide the needed information on markets, customers and suppliers in developing regions. • Information access improves social capital and competitiveness. • Technological change policies must acknowledge social impact. • Access to social networks, for information, is critical for micro-entrepreneurs. • Social network biases play a role in economic development. • Government/private coordination is necessary for information transfer to social networks. • It is easier to transfer knowledge through technology in the absence of cultural assumptions related to the knowledge domain. • Success of government IT implementation projects is connected to visibility of the projects to the populace.	• Castells (2004); Hamelink (1999); • Fine (1999), Serageldin & Grooteart (2000); Steinmuller (2004) • Duncombe and Heeks (2002); Heggelund (2006); Philips et al. (2007) • Ciborra & Navarra, 2005, Krishna & Walsham, 2005, Shaomin, 2005, Ulrich & Chacko, 2005); • (Chilundo and Sahay, 2005, Kimaro and Nhampossa, 2005, LuÃs Mosse and Byrne, 2005, Mosse and Sahay, 2005); • Indrajit et al. (2007); Nuno (2006); Kang and Lee (2007); Smith (2005); Nielsen (2006); • (Furuholt and Ã˜rvik, 2006); Majharul (2007) • Shirin (2006)

Human	• Human development may drive technological advances. • Technological development improves human capabilities. • Commitment from public/private stakeholders necessary to mobilize resources for human development. • IT infrastructure for healthcare improves human development. • Understanding of human context is necessary to carry off IT educational interventions. • Incentives are necessary to empower the poor towards education	• (Ezer, 2006, Jacucci et al., 2006, Musa, 2006, Reinhard and Macadar, 2006, Sahay and Walsham, 2006); • Birdsall and Birdall (2005); • UNDP (2001); • Cecchini and Scott (2003); • Salvador et al. (2005); • Gillard et al. (2007); Ito (2006); Ben-Porath (1967)

Table 1. ICT effects on Development

Schumpeter's (2002) theory of economic development suggests that innovations, such as Information Technologies, can enable an economy to stimulate growth. He also suggests that education has the effect of increasing the ability of factors of production to generate income and growth. Schumpeter's contribution to development economics is the concept that economies go through cycles of growth. He suggests that through technical and organizational progress, development takes place as knowledge progresses. New technical innovations can bring about development if they offer opportunities for new enterprises. In addition to being an economic phenomenon, Schumpeter purports that development is essentially a disturbance of equilibrium of the economy which he suggests is a static one. The third characteristic of development, according to Schumpeter, is that it occurs in waves or separate partial developments that follow one upon the other. While development brings about gains in value, it also leads to losses in value (Schumpeter 2002). This view of economic development theory has been influential in studying changes in economies at the global level.

Through a case study of Korean employment, Kang and Lee suggest that regional social networks and social biases can support or undermine economic development; they have the potential to hinder development if they cause resources to be allocated inefficiently. Moreover, social network bias effects may be self-reinforcing. In order for development to proceed, negative network effects must be disrupted (Kang and Lee, 2007). Smith suggests that the effectiveness of a vaccination project in Kenya was largely tied to market efforts carefully coordinated among the Kenyan government and various private organizations. His research appears to support the idea that a high level of private/public coordination is necessary for important messages to penetrate social networks (James, 2005). Research by Louise Nielsen et al. (2006) suggested that shared cultural beliefs tend to dominate in the face of 'foreign' (modern, science-based) information when remedies overlap. Nonetheless, it is possible for the two domains of knowledge to coexist (Louise Nielsen, 2006). Madon (2006) suggests that the effort expended on government efforts in the Indian state of Gujarat was highly related to the projects' visibility to the public. Thus, government kiosks received large investment while backend infrastructure necessary to parse the data from the kiosks languished. The paper suggests that projects are best served by a degree of transparency and promotion by the sponsoring agency (Madon, 2006). In another study, Majharul et al. (2007) suggest that web forums in Bangladesh are designed from a 'collectivist' rather than an individualistic point of few. The differences described between American and Bangladeshi forums serve to highlight the necessity of understanding cultural assumptions before embarking on a technology project (Majharul and Paul, 2007).

The social perspective of development has its focus on improving core aspects in a society such as government, healthcare, education, environment and community services (Hamelink, 1999; Qureshi 2005). In particular, egovernment research has shown us that people have better access to government services when provided with infrastructures to do so, in some cases the ICT infrastructures have enabled better access to government services; in other cases these same infrastructures have excluded populations who do not have access to ICT infrastructures from gaining access to government services (Ciborra and Navarra, 2005, Krishna and Walsham, 2005, Shaomin, 2005, Ulrich and Chacko, 2005). Similar cases have been reported in healthcare (Chilundo and Sahay, 2005, Kimaro and Nhampossa, 2005, LuÃs Mosse and Byrne, 2005, Mosse and Sahay, 2005). In the same vein, the effect of using ICTs or adopting ICTs in education have had their challenges but the opportunities have also enabled better access to education for underserved populations (Furuholt and Ã˜rvik, 2006). Indrajit et al. (2007) review India's distance learning programs and discover that there is significant opposition from professors, who fear that e-learning applications will make them obsolete. The study concludes that in order for uptake of e-learning services to take place, it is necessary to persuade professors of such services' benefits so they can then endorse them for students; the old social order (teacher/student) must be connected to the new technology (e-learning) before e-learning can be adopted (Indrajit and Kunal, 2007). For such technological changes to be successfully implemented, shared understanding regarding the benefits of such initiatives needs to be achieved at the individual and most importantly at the community levels. Martins (2006) argue strongly that economic analysis in a social context cannot be defined by the 'perfect determinism' of economic laws. Thus, he implicitly and explicitly supports the work of Amartya Sen, who argued for a balanced national investment in

economic, political, and social causes in order that the individual might have maximal agency and self-determination (Nuno, 2006).

Social capital appears to have an effect on how ICTs can bring about development. This concept refers to the characteristic of social interactions and networks that can provide value added resources to a society. In the context of world development, increasing importance of social capital is being recognized as a key component affecting the increase in incomes (Fine 1999). Serageldin & Grooteart (2000) suggest that, at any given time, every country has appropriate levels of social capital, and that over time the total composition of social capital should increase through accumulation. Steinmuller (2004) claims that ICTs may help communities to have enhanced capabilities of global sourcing of knowledge and problem-solving activities resulting in greater social capital. Steinmuller goes on to say that the social networks of communities of practice help extend knowledge markets. In addition, he states that changes in communities of practice that are impacted by ICTs may have implications for growth, competitiveness, and employment. It then appears that ICTs have a role to play in enhancing and promoting social capital within communities and in turn serve as a strong force in enabling literacy and education within and among communities. In a study by Heggelund (2006) suggests that the use of new technologies have powerful indirect impacts, both environmental and in terms of disrupting existing social support networks. He argues that technological changes must be accompanied by a social impact review (Heggelund, 2006). Phillips et al. (2007) examine the practices of Zambian entrepreneurs and discovers that their primary difficulty of growing their businesses lies in the area of risk assessment. The entrepreneurs, she discovers, have been making poor decisions based on inadequate information obtained from informal sources. Her research suggests that training and information availability provide the keys to business expansion for microenterprises (Phillips and Bhatia-Panthaki, 2007). This study has direct implications for the importance of social networks that are available for such micro-entrepreneurs that help provide them with the necessary information needed for their businesses.

There have been some studies that have looked at specific relationships between human development and ICTs. Birdsall & Birdall (2005) conducted a statistical analysis on the Human Development Index (HDI) and the Digital Access Index (DAI) and found that they both have a strong correlation to one another. They also revealed that a spatial component plays a role in determining the actual direction of the relationship between the two indices. Their results indicate that improvements in human development may possibly drive technological advances and not the other way around as asserted by so many early researchers in this area. Although this study found significant relationship between human development and digital access, there was no evidence of the study's findings being related to any derivation of relevant theories. In another study, Hill and Dhanda (2003) looked at the HDI and the Technology Achievement index (TAI) and found that there was a strong correlation as well as a reciprocal relationship between the two. In other words their results implied that advances in technology brought about human capabilities through efficient processes in the dissemination of progress in medicine, communications, agriculture, energy, and manufacturing. In addition, the reverse relationship was also supported wherein betterment of human capabilities in education, income, health, and political freedom stimulated the creation of knowledge necessary for rapid technological change.

In a UNDP report, *Promoting ICT for Human Development in Asia* (2001), it was highlighted that in order for developing countries to achieve improvement in human development by sustaining the benefits obtained from ICT implementations, various stakeholders (governments, civil society organizations, the private sector, and individuals) need to commit to and mobilize resources. A Study by Salvador *et al* (2005) showed the setting up of telecenters and cyber cafes in developing countries helped increase access to knowledge and information. The telecenters created an enabling environment that assisted the people in the surrounding community to reach out to a wider spectrum of capabilities. In the same vein, a study by Cecchini & Scott (2003) showed how implementation of IT infrastructures in healthcare provision in rural India can bring about improved human development.

The following section takes the insights that we obtained from the literature that was used to develop the representation framework of ICT effects on development and translates it to the context of micro-enterprises in developing regions through an information systems architecture adapted from the Zachman framework (Zachman, 1999).

ANALYSIS: INFORMATION SYSTEMS ARCHITECHTURE FOR MICRO-ENTERPRISES IN DEVELOPING REGIONS

In this section we use the insights from the literature about what is known and develop an information systems architecture that may be used to enable a descriptive view of micro-enterprises in using IT to grow. The concept of information systems architecture has become a necessity for establishing order and control in the investment of information systems resources (Zachman, 1999). Most large organizations today have information systems supporting decision making, coordination, and control and may also help managers and workers analyze problems, visualize complex subjects, and create new products (Laudon and Laudon, 2000). As information system implementations become more complex, there is a need for a logical construct or architecture for defining and controlling the interfaces and the integration of all of the components of the system.

Such architecture will act as a way to pass from chaos and disagreement to order and structure (Inmon et al., 1997); will enable an integrated vision and a global perspective of informational resources (Niederman, 1991); will enable the discovery and elimination of redundancy in the business processes reducing information systems complexity (Cook, 1996); and finally will become the bridge between the business and technical domains (Young, 2001). Subsequently the Zachman framework was developed. The framework proposes a logical structure for classifying and organizing the descriptive representations of an enterprise, in different dimensions, and each dimension can be perceived in different perspectives. The IS architecture is described across two independent aspects. The first aspect of the architecture is the rows which represent the different perspectives which may be used to view a business, a situation, an opportunity, or a system. These perspectives represent the points of view of all the participants involved in the planning, conception, building, using and maintaining activities of an organization's IS (Inmon et al., 1997). Zachman (1999) outlines the participants as follows: (1) someone who has undertaken to do business in a particular industry (scope), (2) the business people who run the organization (enterprise model), (3) the systems analyst who wants to represent the business in a disciplined form (system model), (4) the designer, who applies specific technologies to solve the problems of the business (technology model), (5) the builder of the system, and finally (6) the system itself. The second aspect of the architecture is the columns which provide a focus on each dimension while keeping the others constant (Hay, 1997). Specifically, the columns are: 1. What? (Data) – understanding of the enterprise's data, 2. How? (Function) – describe the process of translating the mission of the enterprise into successively more detailed definitions of its operations, 3. Where? (Network) – This column is concerned with the geographical distribution of the enterprise's activities, 4. Who? (People) – describes who is involved in the business and in the introduction of new technology, 5. When? (Time) describes the effects of time on the enterprise, 6. Why? (Motivation) – deals with the translation of business goals and strategies into specific ends and means.

In past studies, the Zachman framework of IS architecture has been used to focus and bring clarity to large organizations and their corporate infrastructures (Pereira et al., 2004; DeLooze et al., 2001; Inmon et al., 1997; O'Rourke et al., 2003; Perkins, 2001). Our research addresses communities of micro-entrepreneurs and their challenges. In order to support their ability to use and adopt technology to grow their businesses, this section develops upon those challenges and what we know about development. Subsequently we do not apply the Zachman framework in its entirety but adapt it to help explain the different perspectives of development such as economic, human, and social and their dimensions to provide an organized architecture for implementing strategies that may be employed by development agencies in the underserved regions where these micro-enterprises reside. The framework given in table 2 below provides a descriptive means to guide IT interventions in micro-enterprises.

	Basic Zachman framework			**Extended Zachman framework**		
	What (data)?	**How (function)?**	**Where (network)?**	**Who (people)?**	**When (time)?**	**Why (motivation)?**
Economic	Data on customers, prices, products etc.	Determine business processes that can benefit from automation	Identify which business units may be connected through IT	Micro-entrepreneur, small business development agencies	Determine the readiness of the business to incorporate IT	Improved revenue, cost savings through administrative efficiencies, competitiveness.
Social	Understand social ties to business Map out community needs	Determine opportunities for partnerships through investigation of common IT platforms for facilitating support & training among Micro-enterprises	Online communities of similar businesses.	Support from family, friends, legal advisors, financial advisors, community development centers.	Know when to ask for assistance.	Improve chances of sustainability through communally oriented microenterprises which are more attractive to investors by virtue of their enhanced stability, size, and cohesion.

Human	Data on owner's Educational background; Understanding of how MC perceives /views technology; Their learning Style & willingness to learn	Learning how to use the technology for the business	Determine multiple means to obtain the necessary knowledge/training for the IT e.g. online, workshops, seminars, college courses.	Micro-entrepreneur, local universities and community colleges	When to go for help, training.	Skill enhancement, control of business through IT, self-empowerment, learning & labor productivity. Reduce fear of IT through education & awareness to empower owners to take control of IT for their business.

Table 2. Information Systems Architecture for Micro-enterprises in developing regions

In interpreting the architecture given in table 2 we see that along each row we have each of the development perspectives i.e. economic, human, and social development. If we read along each row we see the descriptions of each dimension for that development perspective. For example, for the economic development perspective, it is necessary before any IT intervention takes place that data on the micro-enterprises' services, products, prices, customers, markets, etc. are obtained to get a sense of the business. An understanding of the processes of the business is also important as it will identify which operations are amenable to the incorporation of IT and also which operations may be connected with each other. As we are dealing with very tiny businesses, the key stakeholder is the micro-entrepreneur that will be responsible for any resulting change in the business. For an intervention to be most effective, a crucial requirement is the timing. It will be necessary to assess if the micro-enterprise is ready for using any new technology in the business. The last column in this economic perspective deals with the motivation factor. By intervening into any micro-business with IT, common resultant effects would be to increase their revenue and/or cost savings through administrative efficiencies, and also make them more competitive with other businesses. Keeping these issues in mind will enable effective intervention strategies to be tailored for micro-enterprises to enable economic development. In the same fashion, reading along the rows for human and social development perspectives provides an understanding of the issues that need to be considered as interventions are designed to target those perspectives respectively. As a whole, this IS architecture for micro-enterprises in developing regions provides a systematic view of the considerations that need to go into the design of any IT interventions targeted to help micro-enterprises in underserved developing areas to help further the development goals of that region.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Microenterprises are the dominant form of business in most developing countries and are mostly part of the informal sector of societies and subsequently do not benefit from macro-level policies that have been used in the past. While it is helpful to broadly conceptualize the challenges of development in a globalized economy, at some point, researchers need to focus on tackling these challenges in specific contexts, using tested, repeatable strategies. It is not enough to assert that each intervention is individual (the particularistic viewpoint). Nor is it enough to broadly sweep a set of interventions into a particular category. What is needed is a series of guidelines to both identify the kind of intervention needed, and order its execution. Technology has been repeatedly asserted as the determinant of performance in the global knowledge society. The IS architecture for micro-enterprises in developing regions as given in table 2 above has implications for the types of interventions that may be further researched as well as applied by practitioners in the field and is described below for each of the development perspectives.

IT interventions targeted for economic outcomes must not ignore the needs and goals of the micro-enterprise for both the short and the long term. Short term IT interventions may lead to immediate effects such as improved administrative efficiencies through time savings in record keeping, accounting, and placing orders (Wolcott et al. 2008). Long term IT interventions would involve training micro entrepreneurs to take control of their own technological destiny through informed decisions, the use of modern business thinking and processes, effective online marketing, and connection to the global marketplace to enable greater access to customers, information and expertise. Wolcott et al. (2007) and Qureshi et al. (2008) showed how context sensitive IT interventions have the capacity to enable job creation within micro-enterprises.

Vargas (2000) emphasizes community development and strong social networks to help microenterprises improve their survival; Vargas notes that communally oriented microenterprises become more attractive to investors by virtue of their enhanced stability, size, and cohesion. It is important that electronic systems facilitate the social development of enterprise, by providing community forums where entrepreneurs can go for help and advice in navigating financing and credit issues,

government bureaucracy, and the marketplace itself. Partnerships among multiple microenterprises should be fostered, along with collective action. In interventions, common technology platforms should be created to ease support and training issues, as well as collaboration difficulties that would be greater if differing systems were used in interventions. Group buying power should be leveraged where necessary, and open source solutions favored where shared development efforts can benefit the community. Targeting technology to facilitating community and social networks has implications for economic growth (Hoff 1998).

In terms of human development on the part of micro-entrepreneurs, technology should be used to reduce these entrepreneurs' barriers accessing schooling and continuing education. E-learning methods/distance learning comprises one possible route to lowering these kinds of barriers. Technology should also be used to improve access to healthcare and insurance. Online applications are one obvious way in which barriers can be lowered, if these are specifically targeted toward consumers with low technology literacy. Additionally, online treatment recommendations and treatment monitoring provide another avenue for progress in this area. Wolcott et al. (2008) highlighted that fear of technology was a major barrier for micro-entrepreneurs. Targeted training through creation of awareness of the benefits of the technology and providing hands-on training helps minimize the fear of technology and provides a means for empowering the micro-entrepreneurs to take control of the technology for their business (Conger and Kanungo 1998, Sen 1999).

It then appears that IT interventions designed for economic, social, and human outcomes are necessary to enable micro-enterprises to grow.

CONCLUSION

This paper develops an inductive bottom-up means to present an integrated architecture that provides a descriptive and organized view of how IT interventions may be guided to enable economic, human, and social development in micro-enterprises in developing regions. It does this through a review of the literature on what is known about how ICTs effect economic, social and human development. The results revealed that while there are a few highly cited articles on economic, social, and human development, few articles actually explain how technology enables any of these outcomes to be achieved. The analysis of this paper brought together these perspectives and highlighted the themes that can be used to support ICT implementations in developing regions. Given that the predominant form of business in developing and underserved regions are micro-enterprises with less than 5 employees, we focus our analysis on developing insights for ICT interventions in micro-enterprises through an architecture adapted from the Zachman framework. The contribution of this paper is in the architecture that integrates the economic, social and human perspectives on development to enable ICT interventions to be developed to enhance the survival and growth of micro-enterprises. Additionally, we use insights coming out of the architecture to provide recommendations for ICT interventions within the micro-enterprise context. Further research should develop specific ICT interventions and investigate their effects on development.

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