Discovering Development outcomes from ICT interventions in a set of micro-enterprises operating in low resource environments

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ABSTRACT

The concept of Development has alluded scholars and practitioners when information technology becomes prevalent. The majority of research in the Information Technology for Development (ICT4D) field is considered to be practice intended to make the world better with Information and Communications technologies (ICTs). In addition a majority of well-intentioned ICT4D projects tend to fail, often due to unrealistic expectation set by development agencies responding to their political objectives. At the same time, Information Systems (IS) research is ripe with well-studied concepts on IT adoption (i.e. TAM/UAUT: perceived usefulness, ease of use), that do not offer insights on the effects or outcomes of technology adoption. The result is a plethora of research in the variables studied as part of Information Systems adoption research that do little to assist small and micro-enterprises struggling with technology.

This research investigates ICT interventions in a set of micro-enterprises operating in low resource environments randomly selected from a public database of about 30,000 micro-enterprises in Nebraska. Based on prior research in which we used grounded theory to analyze the ways in which ICTs are used by micro-enterprises, concepts were developed further to build theory of IT adoption in sets of micro-enterprises. This project proposes to test the theory of ICT adoption micro-enterprises by developing, testing and deploying an IRB approved instrument to the sample of micro-enterprises randomly selected for this study. The results are analyzed quantitatively to 1) identify the concepts that affect the use of ICTs in micro-enterprises. Based on the quantitative analysis a set of micro enterprises are selected to receive technology and training interventions. These micro-enterprises receive interventions customized to their needs.

The results of these interventions will be assessed qualitatively using grounded theory analysis to 2) discover the ways in which ICTs are used to support business development and growth and 3) arrive at development outcomes from the ICT usage by micro-enterprises. The potential scientific contribution of this research is in advancing knowledge of the concepts that involve the development of micro-enterprises. It also offers insights into the technology and training interventions needed to enable the growth of micro-enterprises. Such contributions, as provided in this proposed project, entail the discovery of factors that can 1) enable information systems outcomes to be assessed in terms of their success in enabling micro-enterprises to grow and 2) offer strategies for improving the lives of people, in particular the micro-entrepreneur, through IS. The societal impact of this study is in offering specific new knowledge that can be used by policymakers in supporting small business development efforts through investments in ICT infrastructures.

Keywords: Development, Micro-enterprises, Information and Communication Technologies (ICTs)

1. Introduction

The purpose of this research is to investigate discover development outcomes from technology and training interventions in micro-enterprises operating in low resource environments. The potential scientific contribution of this research is in advancing knowledge of the effects of Information and Communication Technologies (ICT) adoption in micro-enterprises and through this adoption, identify the factors that lead to their growth. The societal impact of this study is in offering specific new knowledge that can be used by policymakers in supporting small business development through targeted investments in ICT infrastructures. It has been suggested that the success of Information and Communication Technologies (ICTs) the world over has led to concerns that "the distinct research contribution of the Information Systems (IS) field could become lost and that the field itself may decline". (Walsham, 2012, p.1). In his research commentary entitled "Are we making a better world with [Information and Communication Technology] ICT", Geoff Walsham (2012) argues that the Information Systems field has changed dramatically. He states that ICTs are pervasive in all organizations around the world as new technologies continue to proliferate and even the poor of the world have started to get engaged with ICTs, largely through the phenomenal growth in ownership and usage of mobile

phones. He offers a unifying vision for the Information Systems Field by suggesting more interdisciplinary research to make a better world with ICT. He offers the Information and Communication Technology for Development (ICT4D) subfield as an exemplar of such interdisciplinary research to show that in addition to the unifying vision, researchers can adjust their ethical goals and critical agendas to investigate how ICTs can support the poor and identify who is being left out. In particular, can the spread of smartphones, he asks, enable the poor to access the Internet and how can this help to reduce poverty? (Walsham, 2012, p.91).

On the other hand, it has been argued that ICT4D research fails the poor because: 1) few researchers engage in advancing policy positions needed to make a difference, choosing instead to focusing on highly specialized, largely quantitative studies that make ICT4D research less accessible to the general public; 2) ICT4D researchers do not engage closely with the users of their research findings thus disconnecting findings from real-world issues; and 3) reinforced by a publish or perish culture that is obsessed with citation rates and impact factor, few researchers engage in advancing policy positions or contributing to practice (Harris, 2015; Davison, 2012). While they may be well-intentioned, there is a sense that technology development projects also fail the poor by failing to address the challenges that they are supposed to address (Heeks 2002; Kleine & Unwin 2009; Easterly & Easterly, 2006). Davison (2012) adds that "in order to make a better world, changes are needed in our research and practice" (p.100). He argues that the "straightjacket of approved journal lists" regulate researcher's freedom of choice with respect to venues for publication of research. Given that journals are compelled to promote research that is both practically relevant and conforming to standards of scholarly rigor, reviewers are not always so broad-minded as to accept research that promotes a broader ethical agenda of making a better world. Hence the pragmatic researcher is likely to choose research topics, methods and approaches that are more orthodox and aligned with the status quo, so as to maximize publication potential. He suggests that "Instead of a deluge of well-done trivia, we need an iconoclastic approach to orthodoxy and a flourishing of innovative research that contributes to making the world a better place" (Davison, 2012, p.100).

Such calls to action have been echoed by academics from around the world. There is a sense that IS research needs to address global development issues (Joia et al., 2011). As ICTs continue to penetrate people's lives the world over, there is a sense that understanding the role of ICTs in the context of development needs to be conceptualized theoretically while making

empirical contributions that address people's lives and add to what we know (Sahay & Walsham 1995; Sein & Harindranath 2004; Avgerou, 2008; Davison 2012). Other scholars have pointed to the importance of this research for the field of Information Systems in offering broader contributions. Avgerou (2008) suggests that in the era of globalization such research offers contributions in Information Systems beyond "organizational and national boundaries and support global economic and political activities" (p.134). In this way the concept of development has come to be used to conduct research and offer contributions that lead to improvements in people's lives in local organizations, communities and globally.

This research investigates the use of ICTs through a form of organization found in the underserved and developing communities in the USA, the micro-enterprise. The micro-enterprise is chosen as the unit of analysis as it is most often the only way in which people in low income and developing regions can sustain themselves. The micro-enterprise is a form of small business which is a sole proprietorship with 1-5 employees often run by a micro-entrepreneur. Over 90 percent of the world's businesses are micro-enterprises the majority of which are found at the bottom of the pyramid (Tarafdar et. al., 2012; Qureshi et. al., 2009). These range from corner stores, to subsistence farms, fishermen and street vendors; they operate on limited resources, including capital, and their survival depends upon the micro-entrepreneur's resourcefulness, skills and motivation. Research has shown that micro-enterprises contribute to the development of communities when they grow and create jobs. When micro-enterprises adopt ICTs, their growth can increase by a factor of 3.4% (Qiang et al., 2006). In some cases, micro-enterprises have been referred to as the seedbed of industrialization (Grosh & Somolekae, 1996). Yet, given their limited access to resources, particularly capital and expertise, micro-enterprises are unable to gain the benefits of using ICTs as compared to larger organizations. For this reason, only 20% of micro-enterprises will survive in the USA. In order to understand what enables some micro-enterprises to use ICTs and survive despite these challenges, we investigate the research questions: How are ICTs adopted in micro-enterprises to enable their growth? And what development outcomes take place from the adoption of ICTs by micro-enterprises?

In response to these research questions, this project draws upon concepts in Information Technology for Development to study development outcomes from the use of ICTs by micro-enterprises. The following section offers a discussion of the broader impacts of this project and what is already known about the main unit of analysis of the project, the micro-enterprise.

2. Research Background and Context

While the concept of development is a global phenomenon, it is manifested in local communities that often seem to have been left behind. Agricultural workers, coal miners, steel workers and even automobile workers who feel that their jobs have disappeared through the effects of outsourcing and globalization, find themselves looking for other ways of earning a living. Starting their own businesses is often their only recourse out of poverty. The micro-enterprise, which is the smallest form of a small business, is the unit of analysis for this proposed project. The broader impacts of this research lie in understanding the key causes of poverty and addressing these through the adoption of ICTs to stimulate growth in micro-enterprises. The following sections discuss the activities of this project in terms of broader impacts in 1) micro-enterprise and workforce development and 2) research into the role of ICTs in the growth of micro-enterprises.

2.1 Micro-enterprise and Workforce Development

Nebraska is known for disparities in wealth and wellbeing. Child poverty in some counties is as high as 35% (Nebraska Department of Economic Development, 2010). The majority of Nebraska businesses are small businesses of less than 100 employees. These are also known as micro-enterprises most of which according to the Small Business Association are businesses of less than 5-10 employees. As can be seen from Table 1, they continue to create new jobs compared to larger businesses, but have also suffered declining employment, albeit to a lesser degree than large businesses.

Table 1: Nebraska Net Job Change by Firm Size, 2007–2010 (Nonfarm)

Year	Total Net New Jobs	Employment Size of Firm						
		1-4	5-9	10-19	20-99	100-499	<500	500+
2010	-7,337	5,858	760	-12	-2,476	-3,206	924	-8,261

2009	-21,763	4,409	-1,117	-1,997	-2,962	-7,128	-8,795	-12,968
2008	8,172	5,585	159	-954	2,275	1,981	9,046	-874
2007	8,055	5,204	-510	-961	-734	-1,989	1,010	7,045

Note: Data source differs from previous publications. Source: U.S. Dept. of Commerce, Bureau of the Census, Business Dynamic Statistics. (For more detailed data see www.sba.gov/advocacy/849/12162.

According to the Battelle report (2010), Nebraska has a largely agricultural economy with 12 primary industry clusters: Agricultural Machinery, Agriculture & Food Processing, Biosciences, Business Management & Administrative Services, Financial Services, Health Services, Hospitality &Tourism, Precision Metals Manufacturing, Renewable Energy, Research, Development, & Engineering Services, Software & Computer Services, Transportation, Warehousing, & Distribution Logistics. According to the Battelle report, the performance of the majority of these clusters fell short in comparison to the nation in economic output per employee, a key measure that represents the productivity and economic value of products being produced in Nebraska.

Although Nebraska's economic ecosystem is dominated by agriculture, there is the potential for growth in the software and computer services cluster. In addition to the need to support small business development, Nebraska falls short in the use of high-skilled labor across its primary industry clusters (Battelle, 2010, 2.1.2.) The majority of Nebraska's population has a high school and/or college degree. The Battelle report (2010) states while businesses in Nebraska need software and computer services, there have been job losses in this cluster of -16.2% in the metro area and gains of 21.9% in counties with first class cities (Battelle, 2010 p.141). Nebraska's economic development strategy attempts to address the need to support small businesses through the Small Business Innovation Act (LB345), which involves the Nebraska Economic Gardening Program.

However, due to shortages in workforce development, telecommunications infrastructure and technology services, small businesses in Nebraska are unable to reap the benefits of

globalization and participate in the global economy. From 2001 to 2005 (the latest years available), Nebraska grew its new business establishments by 10.7 percent, on average, each year compared with 12.2 percent nationwide (US Census of Business Dynamics). Nebraska's rate of new business formation was generally behind other benchmark states during this period. The job creation rate from these new business establishments averaged 5.2 percent in Nebraska from 2001 through 2005, compared with 6.2 percent for the nation (Battelle, 2010, p.21).

Projections of some of the fastest growing occupations in Nebraska are: Computer Software Engineers, Systems Software at 2.70% and Network and Computer Systems Administrators at 2.10% (Nebraska Department of Labor 2012). Small businesses employed 397,385 workers in 2009 and represented 52% of net new private sector jobs from 2005-2008 (Small Business Administration).   Nebraska is a largely rural state with a metropolitan community experiencing a decline in jobs and increasing income disparities. The average statewide wage in 2009 was $38,225; the metropolitan portion is $41,555 and the non-metropolitan portion accounted for $32,442 (US Department of Commerce). While the state's unemployment rate is below the national average, the poverty rate is just above 12% and is at 12.5% for the rural areas and 12.8% for the urban areas. The total number of jobs declined between 2008 and 2010 by about 3%, as did the level of earnings per job (USDA 2012). At the same time, the number of high school and college graduates steadily rose to 29.6% and 27.7% respectively in the period 2006-2010 (USDA 2012). The broader workforce development impact of this project will potentially offer much needed IT skills to small businesses to help their growth and thus reduce unemployment.

3. Growth of Micro-enterprises through ICTs

The broader impact of the research conducted on this project is to discover how ICTs can enable growth of micro-enterprises. Studies have shown that the use of ICT can play an important role on the growth of small businesses and micro-enterprises (Matthews, 2007; Sullivan, 1985; Qiang et al., 2006; Raymond et al., 2005). Cragg and King (1993) have shown that there is a gradual increase in the number of small firms that either adopt various new technologies or take steps to upgrade what they currently possess. ICT can be employed to bring about increased competitiveness if it enables businesses to create new jobs, increase productivity and sales

through access to new markets and administrative efficiencies (Qureshi, 2005; Matthews, 2007). Micro-enterprises that have adopted and used ICT have seen positive outcomes related to operational efficiencies and 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 of 3.4% 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 ICT. 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 micro-enterprises 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, micro-enterprises can provide better customer service and expand their customer base to reach out to both local and international consumers for their products. In another study, Southwood (2004) found that ICT investments by micro-enterprises in South Africa resulted in profitability gains from cost savings rather than from increase in sales.

It also appears that the promise of ICT adoption by micro-enterprises can potentially provide these businesses with the ability to access new markets and reduce costs through administrative efficiencies (Brown & Lockett, 2004). In their study of 1000 small business enterprises in the U.S., Riemenschneider et al. (2003) found that micro-enterprises were prepared to overcome obstacles to IT adoption to achieve web presence. This is because pressures to keep up with competition and promote services to customers are greater than the obstacles to setting up websites. There is a sense that micro- enterprises hold the promise of growing incrementally on existing capabilities, and provide a seedbed for the emergence of dynamic and efficient larger national firms (Levy et al., 2001; Matthews, 2007; Servon & Doshna, 2000).

However, the use of ICT by micro-enterprises remains a challenge in both developed as well as developing countries (Schreiner & Woller, 2003; Sanders, 2002; Lichtenstein & Lyons, 2001; Hyman & Dearden, 1998; Honig, 1998; Piscitello & Sgobbi, 2004). In particular, the opportunities opened up by the Internet are limited in micro-enterprises especially due to the challenges faced by globalization (Piscitello & Sgobbi, 2004). As micro-enterprises employ less than 10 people, they typically have problems adopting ICT due to competitive pressures and

underestimation of resources taken to implement ICT (Riemenschneider et al., 2003; Qureshi et al. 2009).

The challenges faced by micro-enterprises make it even more difficult for them to adopt ICTs for competitiveness, and these effects are very difficult to measure. In particular, Piscitello and Sgobbi (2004) suggest that the key barrier to the adoption of ICTs is not size but the learning processes, followed by the access to networks of similar internet-enabled business services. In the study by Qiang et al. (2006), only 27 percent of micro-enterprises use e-mail and 22 percent use Web sites to interact with clients and suppliers. The study suggests that if computer use affects firm productivity and IT expands networking within sectors and industries, the micro-enterprises may not be benefiting from these externalities. In addition, Bharati and Chaudhury (2006) surveyed micro, small and medium manufacturing firms within the Boston metropolitan area and found that most of the micro firms were using simple technologies such as basic e-mail, and simple software packages as compared to more complex technologies that were being used by the medium-sized firms. Their survey results showed that the micro-enterprises were not aware of most technologies that could be used for improving their business performance.

While a great deal has been written about the challenges faced by micro-enterprise adoption of ICTs, little has been done to provide business models that enable micro-enterprises to use ICTs competitively. According to Grosh and Somolekae (1996), barriers to growth of micro-enterprises are: access to capital, educational level of the entrepreneur, legal barriers and start-up financing. In their study of information systems for rural micro-enterprises in Botswana, Duncombe and Heeks (2003), suggest that the role of ICT in enabling information and knowledge is important for both social and economic development. They found that rural micro-enterprises typically rely on localized, informal social networks for their information. As information from these networks was of poor quality and not readily available, it appeared to fail the poorest and most disadvantaged entrepreneurs. In this sense, ICTs can represent an unaffordable addition to costs and their benefits are not always apparent (Duncombe & Heeks, 2003; Matthews, 2007; Southwood, 2004).

Micro-enterprises play a very important role in generating jobs, developing business skills, and providing needed goods and services to a community (Duncombe & 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. While 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. Micro-enterprises have shown the potential to bolster communities through income generation and hiring (Good & Qureshi, 2009; Servon & Doshna, 2000). Micro-enterprises have shown the potential to bolster communities through income generation and hiring (Good & Qureshi, 2009; Servon & Doshna, 2000).

The micro-enterprise has become the main unit of analysis when assessing the effects of ICTs on development outcomes (Duncombe & Heeks, 2002; Qiang et al., 2006; Qureshi et al., 2008, 2009, 2010; Qureshi & York, 2008; Kamal, 2009; Good, 2011). Qureshi et al. (2008) found that development takes place when ICT interventions in micro-enterprises lead them to increased competitiveness, administrative efficiencies, information access, and access to new markets. Micro-enterprises play a very important role in generating jobs, developing business skills, and providing needed goods and services to a community (Kamal & Qureshi, 2009; Duncombe & Heeks, 2002; Daniels, 1999). Good et al. (2011) found that the introduction of technology to under-developed communities has great potential to facilitate human, social, and economic outcomes by connecting these communities to networks of resources that would otherwise be out of reach.

This proposed research moves the field forward by offering new theoretical concepts that add to what is known about outcomes from the adoption of information systems. User acceptance of technology is at the heart of IS research. The IS field is ripe with models of Information Technology Adoption and Acceptance with studies that continue to add specific constructs and variables to these models. Venkatesh et al. (2003) identify eight such models: Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1972), Technology Acceptance Model (TAM) (Davis,1989), the Motivational Model (Davis et al., 1992), Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT). In Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) model, four constructs were identified in playing a significant role as direct determinants of user acceptance and usage behavior. These are: Performance Expectancy, which comprises of the variables perceived usefulness, extrinsic motivation, job-fit, relative advantage, outcome expectations; Effort Expectancy, which comprises of perceived ease of use,

complexity, ease of use; Social influence, which comprises of subjective norm, social factors, image; and there are Facilitating conditions, which comprise of the variables perceived behavioral control, facilitating conditions, and compatibility. They theorize that Attitude toward using technology, Self-efficacy, and Anxiety are not direct determinants of behavioral intention and use. Venkatesh et al. (2003) also identified four moderators that affects the direct determinants and behavior intention to use the system. These are experience (duration of exposure to the new technology), voluntariness (whether it is mandatory to use the technology), gender and age. While valuable in their own right, such constructs do not allow for the contextual factors that affect the use and acceptance of technology to be ascertained. Such research assumes that all businesses face the same challenges and are organized equally.

The contribution of ICT4D and ITD to the field of IS lies beyond acceptance and usage behavior to offering ways in which new outcomes may be assessed that lead to measurable improvements in people's lives. In particular, there is a need to offer contributions to IS research that offer theoretical contributions grounded in real experiences. Such contributions can offer outcomes that lead to improvements in people's lives, such as poverty reduction (Urquhart et al., 2008). Over the years there has been a sense that the disparities between infrastructures of wealthy and poor countries could be overcome by developing electronic network infrastructures (Strong, 1985). Research in the field of ICT4D/ITD has since grown to provide specific insight and approaches through which information systems can be implemented and adopted in a variety of cultural contexts. This research has made contributions in providing equitable access to information and knowledge in areas such as education (Rodrigues & Govinda, 2003; Rodrigo, 2003; Scheepers & de Villiers, 2000); healthcare (Braa et al., 2004; Mosse & Sahay, 2005; Kimaro & Nhampossa, 2005); software development (Chudnovsky & Lopez, 2006; Tan & Leewongcharoen, 2005); reduction in poverty (Cecchini & Scott, 2003; Kenny, 2000; Urquhart et al., 2008; Qureshi et al., 2009); better government (Tan & Leewongcharoen, 2005; Walsham & Sahay, 1999;) and off-shore outsourcing (Sahay et al., 2003; Pries-Heje et al., 2005; Hawk & McHenry, 2005).

At the same time, information systems are often relied on to assist in the growth of businesses. Although small and micro businesses often find technology difficult to implement due to resource constraints (Street & Meister, 2004; Raymond, 1985). Street and Meister (2004) point out the important role of Information Systems (IS) in small businesses development and

growth. They find that internal transparency may well be a concept that offers significant potential for IS research. Effective IT interventions may have considerable potential for facilitating IT adoption among micro-enterprises across the United States and the world through the use of low cost option such as cloud computing (Qureshi & Kamal 2011; Song & Qureshi, 2010). Kamal and Qureshi (2009) explore two trends relating to how ICT adoption in micro-enterprises can bring about development. First, micro-enterprises contribute to both economic and social development. Second, ICT can facilitate achievement of an underserved region's development strategies. Research from both these trends, and their intersection, can offer contributions to the IS researcher. Such contributions, as provided in this proposed project, entail the discovery of factors that can 1) enable information systems outcomes to be assessed in terms of their success in enabling micro-enterprises to grow and 2) offer strategies for improving the lives of people, in particular the micro-entrepreneur, through IS.

3.1. Theoretical Framework of ICT Adoption in Micro-enterprises

In this project a set of micro-enterprises' adoption of ICTs was analyzed using grounded theory coding to arrive at the concepts and relations so that they be applied in other similar situations Theory building is described by Corbin and Strauss (1990) as relating categories to their subcategories, and the relationships are then tested against data. In this section, we build theory through comparison with previous data, categories and concepts. The use of theoretical sampling in the previous sections enabled us to draw upon concepts that have been studied in the literature and compare these to our findings. Theoretical coding is used in this section to find out how the categories relate to each other. Theoretical coding according to Urquhart (2013) is "the process of relating categories and the process of theorizing about these relationships" (p.107). When scaling up theory from concepts grounded in the data, it is useful to relate the emergent theory to the literature (Urquhart, 2013). In this section we carry out theoretical coding to arrive at relationships, then relate the emergent theory to the literature to offer a more abstract view of the concepts and relations so that they be applied in other similar situations.

While grounded theory is primarily a qualitative research method for gathering and analyzing data, it is independent of the underlying epistemology and can be used in positivist,

interpretive and mixed method studies (Urquhart et al., 2010). In remaining with the inductive, qualitative nature of this research, we follow Urquhart et al.'s (2010) more iterative process for the generation of grounded theory which involves the following: a) begin with ideational constructs, or seed concepts to select an area of inquiry, b) take slices of data from the area of enquiry and code them into conceptual categories, c) describe these conceptual categories by their properties, d) using additional slices of data, conceptualize the categories into theoretical constructs by establishing 'relations' between them, e) continue to build theory through constant comparison with previous data, categories, concepts and constructs, f) use theoretical sampling to acquire additional data until the existing categories are 'saturated' (i.e. there are no more instances of them in the data), and until no more new conceptual categories or relations emerge. As stated by Glaser and Strauss (1967): "When beginning his generation of a substantive theory, the sociologist establishes the basic categories and their properties by minimizing differences in comparative groups" (p.56).

It has also been suggested that theory can also be scaled up by increasing its scope and generalizability (Urquhart, 2013). According to Lee and Baskerville (2003)'s type TT Generalizability, a researcher may generalize from theoretical propositions in the form of concepts to the theoretical propositions that make up a theory. According to their type ET generalizability, the researcher generalizes from empirical statements to theoretical statements (Lee & Baskerville, 2003). They categorize Glaser and Straus (1967), Strauss and Corbin (1998) and Eisenhardt (1989)'s conceptions of generalizability. In the case of this research we generalize from empirical statements to theoretical statements in the first iteration, then we generalize from these theoretical concepts and statements rooted in the data, to a theory. The result of these iterations is the Theory of ICT Adoption in micro-enterprises illustrated in Figure 1. The theory predicts that a positive development cycle may take place in which additional purchases of ICTs may lead to growth through administrative efficiencies and improved customer service. This would require additional training of employees, hiring of more skilled and full time employees. While it was not evident in this research, the above theory also predicts that the opposite may occur between any of the concepts and their relationships leading to loss in income and a negative growth cycle. Thus the above theory offers specific concepts through which ICT technology and training interventions may be used as catalysts to enable micro-enterprises to achieve positive growth cycles.

Figure 1: ICT Adoption in Micro-enterprises
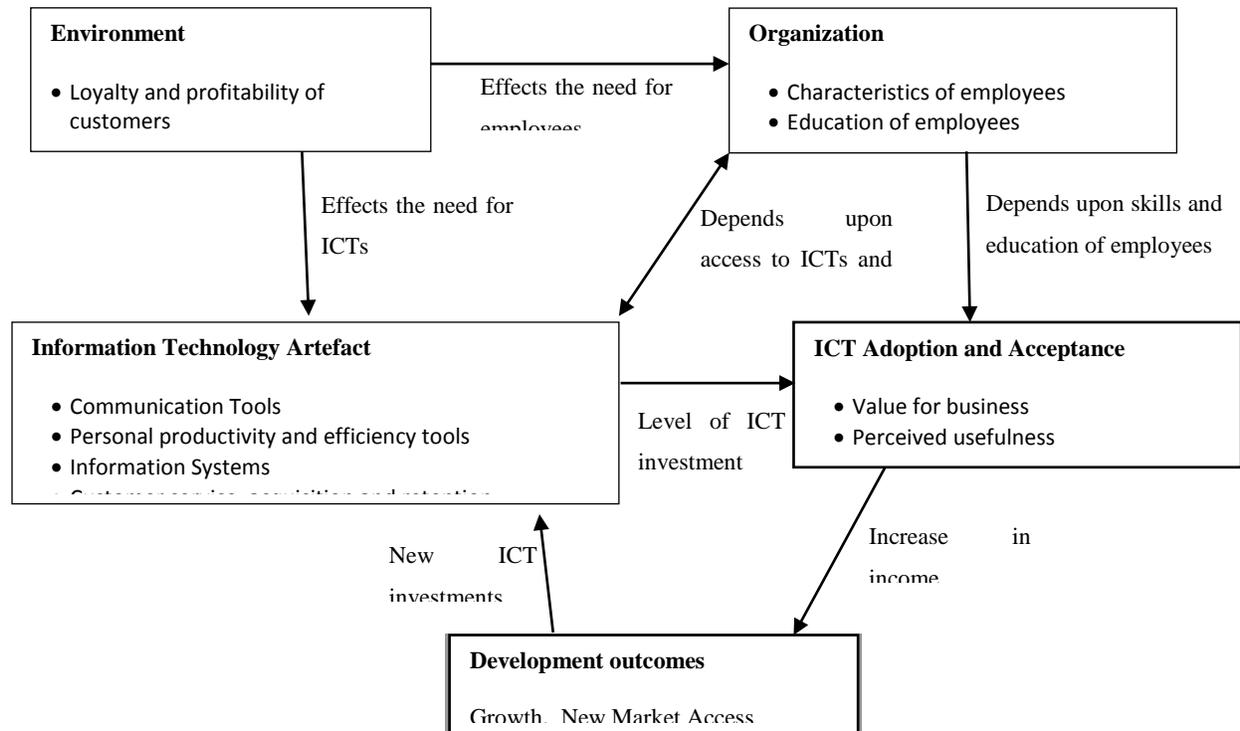
The theory depicted in the above diagram illustrates the concepts and relationships between these concepts. Micro-enterprises in the USA and perhaps in similar settings all over the world, operate in a very competitive environment (Xiong and Qureshi 2012). The concept of the environment in the context of the micro-enterprises entails having loyal and profitable customers *effects the need for* an organization to hire employees and give them the necessary IT skills so they may keep the organization competitive. The competitive environment also *effects the need for ICTs* in a micro-enterprise. The level and type of IT artefact in use by a micro-enterprise also *depends upon access to ICTs and awareness.* For example the high cost and lack of ICT training or capabilities may reduce the micro-enterprises access to the ICTs they need to grow the business. The adoption of ICT and its acceptance by a micro-enterprise is effected by the *level of investment in the ICTs.* The greater a micro-entrepreneur perceives a set of ICTs to be of value for their business, the greater their adoption, even if, the employees do not find the tools and information systems easy to use. The cases studied in this research did report *increase in income*

from their adoption of ICTs. It was the adoption of the ICTs by the micro-enterprises that lead the gains in income, job creation, administrative efficiencies and improved customer service, rather than the acceptance of the ICTs by the employees – many of whom were reluctant or unable to use ICTs in some cases. Development outcomes of growth and new market access lead most of the micro-entrepreneurs we studied to plan *new ICT investments* (Xiong and Qureshi 2012, 2015).

Collectively, micro-enterprises have been viewed as a way in which poor and vulnerable groups of people increase their income and ultimately break the cycle of poverty and even spur sustained economic development in their communities (Vargas 2000, Grosh & Somolekae, 1996). According to development economist, Schumpeter (1932), it is the innovations that enable businesses to survive businesses cycles, which would otherwise destroy them, that contribute to the growth and ultimate survival of businesses. He suggests that innovation is the implementation of a new change that affects and alters a market. Innovations are not just inventions, but can be new processes or new markets. Schumpeter also suggests that the entrepreneur is the agent of innovation whose adoption of the innovations will enable the business to survive and potentially grow. Further research would have to be conducted to develop these concepts further of micro-enterprise adoption of ICTs in different contexts.

This proposed research tests the above theory using a quantitative approach to collecting data through a survey instrument which we will administer to a random sample of micro-enterprises in Nebraska. The following table 2 offers an illustration of the concepts used to construct the survey instrument:

Table 2: Concepts for Survey Instrument

Concepts	Description	Questions	Slices of data (Grounded Theory)
Environment	The arena in which an organization conducts its business (Tornatzky & Fleischer, 1990)	Who is the competitor of your business? Do you receive support you conducting the small business? What are the characteristics of the employees?	"we have a lot of competition", "most Chinese restaurants [are] my main competitors", "completion directly from the local market" "government also give us a tax discount"

Organization	A social group which distributes tasks for a collective goal (Street & Meister, 2004),	What is the size of your small business? What is the communication method you use during the business process? How many employees do you have?	"my employees are very hard-working", "15 full-time employees and 8 part-time employees",," I will call my employees if I have any issue. Part of the business process is conducted via Internet and iPad as well", "Email, phone, and skype are the main ways we communicate"
The ICT Artifact	ICTs are viewed as tools that process information, enable communication and alter relationships. The Ensemble view conceptualizes ICTs as part of a bigger package(Sein & Harindranath, 2004)	What kind of technology do you use? How long have you use this kind of technology? How much do you spend annually on information technology? Have the ICTs you use changed your way of doing business?	"WIFI for about 6 years and Miracle system for 4 years", "computer, telephone, and iPad based ordering system right now", "online delivery and ordering system to expedite the ordering process",
IT Adoption	Perceived usefulness: "the degree to which a person believes that using a particular system will enhance his/her job performance" (Davis, 1989, pp320), Improved relationships with clients (Riemenscheider et al., 2003)	Does using technology give you more control over your business? Does it enable you to accomplish tasks more quickly? Using IT in your business enable you to get more customers? Does makes IT easier to take care of the customers?	"Using cell-phones can help me attract more customers", "I do believe the new online ordering system helps my business a lot", "I would never be able to make it without the IT support."
	Ease of use "the degree a person believes that using a particular system would make it free of effect" (Davis, 1989, pp320)	Will you spend a lot of time learning to use the technology? How much time do you spend?	"I will not spend a lot of time learning to use the cell-phones", "I usually spent about 2 hours everyday online to conduct business, which takes about 20-25% of my businesses" "iPad is very easy to use"
	The perceived cost "value of money that has been used to get the service" (Davis, 1989, pp320)	How much will you invest on the Information Technology?	"I spent $3000 to update my computer system and pay for the high speed Internet", "Annually I invest $5000 on Information Technology, including the iPad that I got last year", "I am confident for my company's future and I am willing to invest more in the future for the IT related cost."

Development	Income generation, job creation, access to new markets (Qureshi et al., 2009). "The interruption of the business cycle" Schumpeter (1932)	What are the Increase in income, growth, job creation and clientele of your company?	"my business did grow during the past two years… I have to invest more on IT to face the competition", "I could see a lot of increase in income right now from using the technology"

Environment is an important construct that is defined by Tornatzky and Fleischer (1990) as "the arena in which an organization conducts its business". For example, the competitors, the regulations, and the attitude from the government could be the potential environment. Our grounded theory analysis found that the environment comprises of loyalty and profitability of customers which includes labels for long history and experience of the business, the diversity of customers, and profitability of customers; and the competitive environment in which the competition and availability or lack of external support can affect the survival and growth of a business. This is akin to the TOE framework which suggests that environmental context affects the process of adopting and implementing a technological innovation within an organizational context, and environmental context (Xu et al., 2004). Tornatzky and Fleischer define the environment as the external environment (Chau & Tam, 1997).

Organization is a well-known concept. Our grounded theory analysis suggests that the organizational context comprises of the education level of the employees and the relationship between the employees. We found that the organization's growth and survival depends upon the following characteristics: characteristics of employees in terms of how hardworking they are, whether they are family, part time or full time; education of employees and the organization's information technology capability found in terms of the IT skills of its employees and the level of training they receive. According to Street and Meister (2004), these small businesses operate under significant constraints with respect to capital, managerial time, and expertise. They found that information systems could improve communication in the small business.

The Information Technology Artefact has been described as a means of conceptualizing how technology is viewed and used (Orlikowski & Iacono 2001; Sein & Harindranath, 2004). In the grounded theory analysis of all of the cases we found the information technology artefact to be comprised of communication tools, personal productivity and efficiency tools, information systems that support the organization as a whole and customer service, acquisition and retention tools. The sub categories for the IT artefact of communication tools, personal productivity and efficiency tools are akin to Orlikowski & Iacono (2001)'s *Tool view* of technology in which technology is seen to enhance personal productivity where "technologies are seen to be 'productivity tools'.. that enable individuals and social institutions to extend their reach and achieve performance benefits in the course of their ongoing socio-economic activities." (p. 123). The micro-enterprises' use of the IT artefact as information systems that support the organization as a whole and customer service, acquisition and retention tools is more akin to the *Ensemble* view of technology. In the cases studied here, the technology is viewed as an embedded system where it is seen to be enmeshed with the conditions of its use. While Orlikowski and Iacono

(2001) offer views of the IT artefact, Sein and Harindranath (2004) suggest that the manner in which ICT is used can enable us to understand its impact. The use of the Information Systems by the micro-enterprises involved accounting and finance, payment, ordering and delivery system, a security system and an online drive through order system. They also used customer service, acquisition and retention tools such as websites, Internet/Wi-Fi, a credit card machine, a two way radio and a customer relationship Management System. It appears that these may have an impact in supporting the activities of the businesses in enabling the micro-entrepreneur to achieve better livelihoods for himself and his employees. It appears that the use of ICTs in the ensemble view are the most studied and there are economic perspectives at the organizational levels that may enable ICT outcomes for development to be considered more specifically (Zhang et al., 2011; Sein & Harindranath, 2004).

Information Technology Adoption and Acceptance is perhaps the most extensively studied concept in Information Systems (see Venkatesh et al., 2003). Much of the literature focusses on using the constructs in these models to identify and test individual acceptance of technology. In particular, the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1972), Technology Acceptance Model (TAM) (Davis,1989), the Motivational Model (Davis et al., 1992), Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT) all focus on individual cognition, preferences and perceptions. Our analysis of this concept takes it up a level to that of the business. It comprises of value for business in which the innovative uses of technology and IT Investment take place. We also found that there were many more labels for perceived usefulness than there were for ease of use. As part of the Technology Acceptance Model, perceived usefulness refers to "the degree to which a person believes that using a particular system will enhance his/her job performance". Ease of use is defined as "the degree of freedom usage of the system and the technology for the users". The perceived cost is defined as the "value of money that has been used to get the service" (Davis, 1989, pp320). Dai and Palvia (2008) employed perceived usefulness and ease of use in their survey of mobile commerce users in China and the US. They found that there were significant differences between users in China and the US in the relationship between perceived usefulness and ease of use and the intention to use mobile commerce. We found that while both sets of micro-entrepreneurs perceived the usefulness of technology to be high and of value to their business, it was the Chinese micro-entrepreneurs and their employees who struggled with using the technology.

The category for **Development** in our grounded theory analysis pertains to the growth of the micro-enterprises through income generation, job creation, administrative efficiencies and improved customer service; and their ability to gain new markets by starting a new businesses, planning new IT investments and implementing new innovations. It has been well documented that businesses that utilized e-mail to communicate with their customers experienced sales growth of 3.4% greater than those which did not and 4% increase in sales as well as 5% increase in export performance was obtained when e-business techniques were adopted by micro-enterprises in the manufacturing sector in Canada (Qiang et al., 2006; Raymond et al., 2005).

Contributions to development outcomes from this research suggest that it is the innovative use of information and communication technologies in micro-enterprises that bring about growth and access to new markets. These innovations, when implemented, challenge the status quo and upset the equilibrium (Schumpeter, 1932). Warschauer (2004) states that the greatest gains to development are not from the adoption of ICT in itself, but from the innovative ways in which technology has been adopted. A key issue for development is not unequal access to computers but the unequal ways that computers are used (Warschauer, 2004).

4. Research Design

The first stage of this research follows a quantitative approach to test the above model. A survey instrument will be created based on the above constructs and submitted to the Institutional Research Board (IRB) for approval. Once approval has been received, it will be tested on students and local micro-enterprises. Any changes to the instrument will be made and re-submitted for approval to the IRB. A random sample of micro-enterprises will be selected from a database of about 30,000 and the instrument will be sent to them. Often the best way to fill out a survey is through in person interviews. We will work with students enrolled in the Information technology for Development courses to administer the survey. Once the survey results have been received, a series of statistical tests will be conducted. Factor analysis (principal component analysis) will first be carried out to identify any groupings in the data. Then regression and/or structural equation modelling will be used to identify the concepts that affect the use of ICTs in micro-enterprises.

The second stage of the project is qualitative. From the pool of micro-enterprises surveyed a second randomly selected set of micro enterprises are identified to receive technology and training interventions. The purpose of this second stage is to discover the concepts that relate to the way in which micro-enterprises use ICTs. In particular we investigate the research question: How do micro-enterprises engage with ICTs in their businesses?

As every micro-enterprise is faced with its own unique reality, the case study method is used in this research to enable in-depth data collection and analysis of ICTs in microenterprises. Compared to other qualitative research methods, the in depth case study allows researchers to with less of a priori knowledge of what the variables of interest to find additional factors that affect the phenomenon of interest while at the same time adhering to the conventions of

positivist research(Benbasat et al., 1987; Yin, 1994; Eisenhardt, 1989). However, the positivist criteria for case study research in information systems are in appropriate for inductive interpretive research (Klien & Meyers, 1999). In order to build theory from case study research, Eisenhardt (1989) offers a set of step: 1) define a research question, 2) select cases based on theoretical not random sampling, 3) craft instruments and protocols, 4) enter the field by overlapping data collection and analysis using flexible data collection methods, 5) analyze the data using within case and cross case analysis techniques, 6) shape hypotheses, 7) enfold the literature through comparison with conflicting and similar literature, and 8) reach closure with theoretical saturation (p.533). While Eisenhardt's method is a more positivist approach to theory building, it provides a structured approach to the bottom-up grounded theory building.

The micro-enterprise is chosen for this study because it is the key organizational form that people in underserved and developing communities relay on to sustain themselves. As micro-entrepreneurs are guided by their unique skills and passion for their craft, their business also gives them the freedom to lead the lives they choose to. Secondly, the micro-enterprises should exist for at least one year, indicting there would not be some other issues that can affect the process of IT adoption. Third, the micro-enterprises should follow the criteria for the small business based on the profit or the number of the employees, which can be found in table 3 below:

Table 3. Criteria for case selection

Description	*Requirement*
General Information	The cases are randomly chosen from the InfoUSA Database.
Challenge	The micro-enterprises are facing challenges in operation, e.g., lack of resources, lack of knowledge, and lack of skills.
Ownership	The ownership of micro-enterprises should be sole proprietorship or partnership.
Potential	The micro-enterprises should 1) have potential to grow and expand their businesses by the usage of IT. 2) have enough funds to invest in IT 3) desire to gain access to new markets.

Years of operation	The micro-enterprises should exist for more than one year, so that endogenous variables lead to the challenge, e.g., lack of cash flow, lack of management can be excluded.
Scale of the Business	The micro-enterprises should follow the criteria of the official definition of small business (SBA 2010)

Source: Xiong Qureshi (2012, 2015)

4.1. Interventions

The interventions on this proposed project involve the diagnosis of problems, identification and trail of alternative solutions, development and implementation of the IT solution and adoption and use of the It solution. Such technology and training of interventions can, on the one hand, lead to a virtuous circle of increased knowledge, social and economic development, and per capita income group. At the same time, failure to properly introduce IT can, on the other hand, isolate a community from the global economy and lead to negative outcomes. These interventions are structured as follows:

1. Diagnosis of problems: The identification of problems the micro-enterprise owner is facing with respect to their business and potential uses of IT. This is an assessment of the needs of the micro-enterprise. Questions asked during the diagnosis phase include: What are the business problems and needs? What are the current challenges and barriers? What are the business goals and how can IT help reach these goals?

2. *Identification and trial of alternative solutions*: In order to determine the best solutions (manual/process and software) that could be applied to solve the problems/needs. Questions to be asked are: what are the available IT skills and knowledge? What are the possibilities of IT adoption? Do they have financial, time and human resources available? What are the possible constraints we may find within the micro-enterprises? What tools cover the problems/needs?

3. *Development and implementation of IT solution:* The selected IT solutions are developed and implemented in the micro-enterprises according to the needs assessment. The repository of tools on the ITDDEV server can be accessed to implement these together with the micro-enterprise owners.

4. *Adoption and use of IT solution*: The implementation and training takes place in the micro-enterprise to finalize the adoption of IT. This stage entails answering the questions: Are the resources available to finalize the implementation? Do we need to change current processes? What ongoing training is needed? Is the technology being used? What are the outstanding outcomes after the IT implementation?

Table 4. Examples of Information Technology Interventions and Development Outcomes

Micro-enterprise	Technology Adoption	Training (Empowerment)	Behavioural Change	Development Outcomes
DN	Business website, back-up and	Website building and	Increased computing hours,	Access to more clients, increased administrative
PK	Software tools consolidated into	Software tools	Increased computing hours,	Labour productivity, increased administrative efficiency,
AM	Music composition system	Software tools and web search	Increased computing hours	Increased administrative efficiency, improved product
JT	Business website	Website building and	Increased computing hours	Access to more customers

Source: Song and Qureshi (2010)

Prior research in which technology and training interventions were conducted on micro-enterprises have shown development outcomes in terms of access to more clients, new markets, administrative efficiencies, and improved service quality (Kamal and Qureshi 2009ab, Kamal et. al. 2010, 2011, Song and Qureshi 2010, Morales and Qureshi 2010, Good et. al. 2010, Xiong and Qureshi 2012, 2015). Good et al (2010), found three subcategories of the tool view (labor substitution, productivity, information processing) as the "direct" effect of IT. In their interventions with Native American micro-enterprises, Xiong et. al. (2015) found additional outcomes such as empowerment to be a direct effect of the micro-entrepreneurs ability to use ICTs to grow their businesses and connect with the community. Learning and labour productivity outcomes where also found to be connected to the micro-entrepreneurs ability to pursue better livelihoods (Kamal and Qureshi 2009a). In their work with micro-enterprises in a Latin American community in the MidWest of the United States, Morales and Qureshi (2010) found that the interventions increased the micro-entrepreneur's capabilities to do new things with technology, to be able to reach new customers or to cover other business and personal needs. For

example, the creation of new website opened new doors to the micro-enterprises to advertise their products in a cheaper way compared to traditional means. There is an effect of such interventions on community development as Good et al (2010) were able to show how the adoption of technology by a set of micro-enterprises lead to other micro-enterprising adopting technologies in similar ways to grow their businesses.

4.2. Mode of Analysis

In order to discover new concepts that may add to our knowledge of factors that affect the adoption of ICTs in micro-enterprises, grounded theory will be used to analyze the results of the interventions. The results of the interventions will be assessed qualitatively using grounded theory analysis to 2) discover the ways in which ICTs are used to support business development and growth and 3) arrive at development outcomes from the ICT usage by micro-enterprises. In this research we use grounded theory to discover theory from data which we systematically obtain and analyze further to Glaser and Strauss (1967). We follow Urquhart et al.'s (2010) guidelines for grounded theory studies in information systems and use this theory discovery methodology to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data.

While grounded theory is primarily a qualitative research method for gathering and analyzing data, it is independent of the underlying epistemology and can be used in positivist, interpretive and mixed method studies (Urquhart et al., 2010). In remaining with the inductive, qualitative nature of this research, we follow Urquhart et al.'s (2010) more iterative process for the generation of grounded theory which involves the following: a) begin with ideational constructs, or seed concepts to select an area of inquiry, b) take slices of data from the area of enquiry and code them into conceptual categories, c) describe these conceptual categories by their properties, d) using additional slices of data, conceptualize the categories into theoretical constructs by establishing 'relations' between them, e) continue to build theory through constant comparison with previous data, categories, concepts and constructs, f) use theoretical sampling to acquire additional data until the existing categories are 'saturated' (i.e. there are no more instances of them in the data), and until no more new conceptual categories or relations emerge. As stated by Glaser and Strauss (1967): "When beginning his generation of a substantive theory,

the sociologist establishes the basic categories and their properties by minimizing differences in comparative groups" (p.56).

5. Conclusions, Expected Contribution to Knowledge

This project proposes to investigate development outcomes from ICT interventions in a set of micro-enterprises operating in low resource environments. The intellectual merit of this research is in the discovery of new concepts that help us understand the factors that enable micro-enterprises to adopt ICTs. The potential scientific contribution of this research is in advancing knowledge of the concepts that involve the development of micro-enterprises. It also offers insights into the technology and training interventions needed to enable the growth of micro-enterprises. Such contributions, as provided in this proposed project, entail the discovery of factors that can 1) enable information systems outcomes to be assessed in terms of their success in enabling micro-enterprises to grow and 2) offer strategies for improving the lives of people, in particular the micro-entrepreneur, through IS. Now that the effects of globalization are permeating multiple facets of life, organization and society, the relevance of ICD4D/ITD research for the IS community has become more apparent. ICT4D/ITD research provides a relevant context with measures, levels of and units of analysis that can inform IS research in ways that may offer contributions to global information systems that comprise multiple geographic, cultural and functional contexts. This research has implications for increasing the relevance of mainstream IS research in areas such as adoption and diffusion of IT (Davis, 1989; Harrison et al., 1997; Venkatesh et al., 2003; Gefen et al., 2003), developing methods and approaches for implementing IS globally and managing dispersed collaborative environments in a variety of contexts including off-shore outsourcing (Tractinsky & Jarvenpaa, 1995, Willcocks et al., 2003, Sahay et al., 2003, Watson et al., 1997, Qureshi & Zigurs, 2001).

The societal impact of this study is in offering specific new knowledge that can be used by policymakers in supporting small business development efforts through investments in ICT infrastructures. In particular, regions in which businesses are struggling can be revitalized through technology and training interventions to stimulate growth in those businesses. While the concept of development is a global phenomenon, it is manifested in local communities that often seem to have been left behind. Agricultural workers, coal miners, steel workers and even

automobile workers who feel that their jobs have disappeared through the effects of outsourcing and globalization, find themselves looking for other ways of earning a living. Starting their own businesses is often their only recourse out of poverty.

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