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# Understanding the Role of Information Technology in the Development of Micro-Enterprises: Concepts to Study in Making a Better World

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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 that do little to make a better world.*

*This paper investigates ICT interventions in three case studies of micro-enterprises operating in low resource environments. Two of the Native American micro-enterprises are taken through a set of technology and training interventions while one receives no interventions. The role of information technology in the development of micro-enterprises is analyzed to offer new concepts that can be studied to offer contributions to make a better world.*

## 1. Introduction

While there is dramatic shift and advances in the usage of Information and Communications Technologies (ICTs) during the past decade, ICTs have been applied to conceptual theoretical understanding of development and empirical contributions [26]. Geoff Walsham [40] argues that Information Systems (IS) community should explore how ICTs could help improve individual capabilities and opportunities in order to make a better world [40]. It is also argued by Qureshi [26] that if the concept of development can be applied towards research and contributions that lead to improvements of people's life, then at some level, we are making a better world with ICTs. Walsham [40] offers a unifying vision of the IS field by conducting more interdisciplinary

research. Even Information and Communications Technology (ICT) has been conceptualized as a tool to achieve social, economic, and human development, little is known about how this tool actually may or may not enable development [43].

Research in the field of Information Technology for Development (IT4D/ ICT4D) has grown to provide specific insight and approaches through which IS can be implemented and adopted in a variety of cultural contexts, including the research of how innovative applications of information technology bring about improvements in the lives of people. These are assessed in terms of economic, social, and human outcomes. Walsham [40] further argues that there is a need for "strong ethical agenda" in order for ICT4D to make a better world. He suggests that both IS researchers and practitioners should emphasize on how the use of ICTs could potentially provide opportunities and capabilities to use technologies to make better lives for individuals, the communities, and the world [40].

However, Qureshi [26] suggests that the ICT4D research fails the poor because 1) there are very few researchers that focus on advancing policy positions rather than quantitative studies, which is less accessible to the public, 2) ICT4D researchers usually don't engage closely with users of the research, and 3) ICT4D research is perished by citations and impact factors. Qureshi [26] proposes a typology for ICT4D research to investigate the role of ICTs in making a better world. Based on different levels of analysis, from individuals to organizations, from countries to regions, different units of analysis, different types ICT uses, and various development outcomes should be investigated.

To respond the call for research from Walsham [40] and Qureshi [26], this paper investigates the intersection between IS and ICT4D by ICT interventions in case studies of small businesses operating in low resource environments to offer contributions that make the world a better place. Based on the typology for ICT4D research, the paper investigates ICT4D at organizational level, i.e. micro-

enterprises. The overall research question is *What is role of information technology in the development of micro-enterprise?*

A case study approach is adopted to investigate the research question. The paper is structured as follows. After the introduction, the theoretical background, including the concept of development and contributions from ITD/ICT4D will be provided. Then the research method, case study, along with the criteria for case selection will be discussed. Results from case interventions and outcomes will then be reported. Data analysis will be conducted followed by the conclusion.

## **2. Theoretical Background**

### **2.1 Development and Role of ICTs**

The Information Technology for Development combines the implementation, use and management of Information Technology infrastructures to stimulate human, social and economic development. The field of Information Technology for Development (ITD), also referred to as Information and Communications Technology for Development (ICT4D) focusses on assessing development outcomes of ICT interventions. The use of ICTs is having a profound effect on the way in which the field is progressing. The growth of the Internet has opened up new opportunities for development. Steinberg [38] suggests that ICT is highly versatile and can help support development efforts if employed judiciously. The term ICT4D denotes a collection of technologies that can be used to stimulate development. In assessing the potential value of ICTs in supporting development requires us to address 1) the extent to which ICTs can enrich people's lives by bringing ideas and experiences to those in the most isolated villages; 2) the technology's record with respect to achieving specific development objectives; and 3) its contribution to overall development and sustainability [38].

The concept of development has its roots in the economics of the firm. Economic development is defined as "the interruption of the business cycle" according to Schumpeter [34] and is often used to describe growth in organizations and the regions in which they reside. The outcomes from the adoption of ICT on development can be assessed in a number of ways. The measures of economic development in micro-enterprises most often used are: increase in income, job creation, and clientele [29]. Social development is a concept of development in social science explores how reality is constituted in the development process [1]. The social development perspective enables a broader understanding of

development to be achieved through top down national policy making processes as well as bottom up, "micro level" traditions like the actor network approaches, which works upwards from individual level actions [1]. Social development activities are designed to raise living standards, increase local participation in development, and address the needs of vulnerable and oppressed groups [22].

While social development efforts relate to building and working with institutions of government, healthcare, finance, and the environment/agriculture, the concept of human development is about enlarging individual people's choices so that they may have the freedom to pursue the lives they value [35]. In this, income is seen to be an instrument of this freedom to pursue their wellbeing. Sen argues that there need to be a broad set of conditions that include access to food, shelter, health, and education that together constitute wellbeing [35]. While wellbeing may vary considerably between individuals, indicators to measure wellbeing include the United Nations Human Development Index (HDI), the Gender Development Index (GDI), and the Human Poverty Index (HPI).

### **2.2 Contributions from ITD/ICT4D**

There are a number of different ways in which development outcomes are studied in ITD/ICT4D research. Country level studies are prevalent in ICT4D research. Examples of such studies are ICTs measured in terms of penetration of mobile phones, broad band Internet, TVs, Radio, and land lines can be seen to enable the capabilities of citizens to achieve wellbeing. There are a number of indicators, based on Sen's [35] and others', are used to assess the ability of a country to provide its people with basic "freedoms". These are 1) rights of political participation and freedom of speech, 2) economic opportunities to participate in trade, 3) social opportunities of adequate health and education, 4) openness in government, and 5) security in the form of law and order and basic social safety nets for the unemployed. Some of the most commonly used indicators of wellbeing at the country level are: the Gross Domestic Product (GDP) or a country's income, which is calculated in millions of US dollars; given that GDP may not reflect cost of living, the Purchasing Power Parity (PPP) offers a measure of the real value of output produced by an economy compared to other economies; and perhaps the most important is the Gini Index which measures the disparities in income within a country [42]. May et al. [21] offer a multi-dimensional view of poverty in which they used monetary metrics, including the Gini coefficient together with human capital indicators to investigate poverty in a set of east African countries.

They found that while financial poverty increased in the countries they studied, some countries such as Kenya saw an increase in human capital. Kenya has the largest number of users in the world of mobile payment systems, primarily through M-Pesa.

A great deal of research in ICT4D takes place at the organizational level. The use of ICTs by Non-Governmental Organizations (NGOs), small and medium sized enterprises (SMEs) has been shown to enable growth, particularly through sustained technology and training interventions [16, 28]. Micro, small and medium enterprises, as well as Social Enterprises and NGOs appear to be at the heart of efforts to understand the effects of ICTs on Development. Case studies and vignettes of how these micro-enterprises use technology to grow, throw valuable light on the needs of people in their respective communities. While the definition of these forms of organization vary between countries, it has been argued that they are more efficient at creating quality jobs, are more innovative, or grow faster than larger firms [13]. Seen as a form of small business, social enterprises and NGOs are also key players in enabling ICT usage to support better livelihoods. Their activities offer non-profit earned income which in turn provides consistent cash flow to further the mission of the organization [19].

In particular, the use of mobile phones in micro-enterprises have been shown to increase the wellbeing of their micro-entrepreneurs by bringing about greater price transparency and elimination of waste [9, 11]. It has been argued that mobile devices represent a way for entrepreneurs to overcome the challenges of doing business as they support communication, enable market information to be accessed, reach new customers, sell their products across geographic areas, get paid through mobile payment systems, and empower women [2, 41, 9, 10, 5]. While the majority of studies focus on the explosive growth of mobile phone usage in Africa, Asia and Latin America, few if any, consider the effect of this ubiquitous technology on the wellbeing of people in North America and Europe. In his review of the literature on mobile usage, Donner [8] categorized these studies into mobile adoption, mobile impact and mobile interrelationships. He found that ICTD studies consider mobile adoption through digital divide, mobile impact on economic growth and livelihoods, and mobile interrelationships through the evaluation or design of ICTD projects.

Donner [8] categorized Information Systems studies as non-ICTD studies which consider the interactions between people and technology with little contribution to development. Duncombe [10] adds that while mobile phone technology is increasingly becoming a key tool for development, the effects of

'm-development' interventions are difficult to measure and often focus on local outcomes. He suggests that the contributions of mobile phone interventions should move from assessing outputs to outcomes and finally impact. In particular, when studying the development outcomes of micro-entrepreneurs that own and make use of mobile phones, a range of indicators can be used such as sales, volume, profit, and market share. At the same time such outcomes are relatively difficult to define and identify, the reliability of data may be open to question due to lack of access to enterprise income and resources.

There is a range of interdisciplinary literature focusing on the ICT4D projects and information systems. For example, Braa et al. [45] discussed the lessons learnt from health information systems in developing countries. Heeks and Bhatnagar [46] provided several implications for the ICT4D project. Also widely studied in the ICT4D field are cases, vignettes and studies of how entrepreneurs in villages and city slums use mobile phones to achieve better livelihoods, fishermen and farmers arrive at better markets through access to information they would not have had without the access to ICTs. Then there are the telephone ladies who went on to run successful business from profits made from selling their mobile phone time [9, 8, 29]. In drawing upon these studies, we can move development discourse forward by offering meaningful theoretical and technological contributions for people living in poverty in the USA and Europe with little or no access to ICTs, such as mobile payment systems that have helped so many come out of poverty in Africa and Asia.

## 2.3 Micro-enterprise for Development

Studies have shown that the use of ICT can play an important role on the growth of small businesses and micro-enterprises [20, 39, 24, 30]. Cragg and King [6] 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 [25, 20]. 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. [24] 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 [30]. Specifically, Raymond et al. [30] 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 [37] 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 [4]. In their study of 1000 small business enterprises in the U.S., Riemenschneider et al. [31] 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 [17, 20, 36].

However, the use of ICT by micro-enterprises remains a challenge in both developed as well as developing countries [33, 32, 18, 15, 14, 23]. In particular, the opportunities opened up by the Internet are limited in micro-enterprises especially due to the challenges faced by globalization [23]. 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 [31, 29].

The micro-enterprise has become the main unit of analysis when assessing the effects of ICTs on development outcomes [11, 24, 27, 28, 29, 16]. Qureshi et al. [29] 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 [16, 11, 7].

In order to discover and understand the role of technology in development of micro-enterprise, the research adopts an inductive case study approach that investigates technology adoption and intervention by micro-enterprises.

### **3. Methodology**

#### **3.1 The Case Study Approach**

This research follows a qualitative inductive approach in which the case study method is used to enable in-depth data collection and analysis of ICTs in micro-enterprises. The paper investigates three cases of micro-enterprises in underserved communities of a Midwestern city in the United States. This research uses concepts from the literature as a lens to collect data and analyze the adoption of ICTs and interventions from three micro-enterprises.

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 [3, 44, 12].

#### **3.2 Micro-enterprise Unit of Analysis and Criteria for Case Selection**

Three Native American Micro-enterprises were chosen for this study. They were chosen for this study because this is the key organizational form that people in underserved and developing communities rely 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 sustain themselves.

While we work with a community partner to help select cases, specific selection criteria consist of the following: 1) Income levels are lower than the average income of small businesses, 2) Micro-enterprises with fewer than 5 employees, and 3) Businesses that will benefit from ICTs even though they are unable to access and use ICTs because of their lack of knowledge and skills. These criteria are listed in Table 1:

**Table 1. Criteria for case selection**

<i>Description</i>	<i>Requirement</i>
General Information	The cases should be chosen through a community partner, in this case Native American.
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 in the United States.

## 4. Results

Three Native American small businesses owners were selected based on the criteria above. Interviews and interventions were concluded in 2015 and 2016. The following sections provide case description, the proposed IT intervention, and outcomes.

### 4.1 Micro-enterprise with IT interventions: PI

**4.1.1 Case Description** PI is a family-owned store. Both the owner and founder are Native Americans. Currently, only 0.7% of the population are Native Americans in this Midwestern metropolitan area. The store offers an assortment of turquoise and silver jewelry, bead and quillwork, pottery, Pendleton and saddle blankets, buckskins, arrows, dream catchers, kachina dolls, wood carvings, t-shirts, books, Native American music, teas, herbs, flutes, craft supplies.

Currently the owner is the daughter of parents, who are the founders. Due to the insufficient funding for the business, the owner could not afford to hire employees. However, from 2007 to 2008, the owner did hire several part-time employees to support the micro-enterprise. It appears that the owner is trying different ways to promote her business, not only including commercials from TV, magazine, and

yellow book, but also from the Internet. The owner purchased a domain and a website was outsourced to a third party with monthly subscription. The owner's son helped establish a Facebook account for the store. Occasionally, promotions are conducted via Facebook and the website. The owner of the store has a fax machine, fixed line telephone, and POS machine onsite. There is no Internet covered in the store. There is a paper-based guest book in the store for potential customers. Customers can write in information and owner will contact them by the phone number they leave.

Most of the time, the owner conducts business by phone. The owner is very afraid of using the Internet technology since she thought it was hard for her to learn, and she did not think the Internet could help communicate with customers. There is very limited information she provides through the website. According to the interview, the owner of the store witnesses that customers are shifting their information-seeking from the Yellow Pages to Google and Facebook.

The store suffers has always suffered from shoplifting due to the lack of funding and employees. The owner could not fully control the space of the store. Interestingly, the owner installed a faked camera in the middle of the store, hoping it would deter the thefts. The owner does not know how to seek the support from the government or other organizations.

**4.1.2 IT Intervention Fully Utilize eBay and other B2B channels:** Owner does not know how to place the order online. At this moment, the only channel that owner places order is through the yellow pages. Owner will check the product from the catalog book, and then places the order via phone. It is not only inefficient, but also owner cannot usually get a good price due to the lack of competition. E-Commerce appears to be an efficient way to help owner reduce the cost. There are different online B2B channels, including eBay, which can provide the owner high quality product with competitive prices. Setting up account on eBay and walking through the purchasing processes with the owner is the first priority of the IT interventions.

**Establish Cloud Based Service For Customer Relationship Management:** As described above, owner's son operates the Facebook account for the store. However, since there is no Internet available in the store, the only way to keep the indoor customer information is to ask them leave their information in the guestbook. Information like names, email addresses, and interests will be recorded. Owner or her son will then manually type the information into the computer. Promotion information will then be sent to their email addresses. On the other hand, fans on

Facebooks will receive promotion information on the homepage of the store. Keeping consistent information from email promotion with Facebook promotion becomes the second challenge for the owner and store. A cloud based service for maintaining customer relationship is the second step of the IT interventions.

**4.1.3 Observations** Following is a description of the observations made in PI as the interventions were being carried out. The IT interventions were conducted at owner's store. There were three visits in total. The IT interventions were conducted during the business hours so sometimes the interventions had to be paused.

The first intervention includes the introduction of the process and potential benefit of the IT interventions. The owner of PI appeared very open to the technologies. She also mentioned that she had tried different channels to advertise products. She had tried to advertise on TV and newspaper. However, they were very expensive. She also tried the advertisement service that Google and Facebook offered. However, she did not know how effective those advertise was.

The second intervention include an official video from eBay to help owner understand the basic function of eBay, the process of placing an order, tracking the order, and other key steps in utilizing the B2B service. After the second intervention, Google docs was introduced as a cloud based service to help owner syncing customer information even when there was no Internet connection. Google docs allows customers to type the information into the computer, rather than writing them down on the guest book. By doing so, owner was able to keep the same pace on the promotion information with customers indoor and customers/fans on Facebook account. Owner of PI was very excited about that service since it was free. Overall, the training with the owner went smoothly.

**4.1.4 Outcomes** Following are the outcomes of the impact that the IT interventions created in PI.

Overcame fear of technology cost: The fear of technology cost was heavily observed during the intervention. Owner was not willing to use premium charged service like Dropbox Business since she had very limited budget in Technology. She also had bad experiences with previous purchases of advertisement service. Thus, all the service we provided were free of charge. By doing so it help owner overcome the fear of technology cost.

Eagerness to learn: Owner was very friendly, humble, and eager to learn the technologies. Besides the training, owner showed her smart phone, and asked how to use the mobile applications to connect with customers.

## 4.2 Micro-enterprise with IT interventions: TC

**4.2.1 Case Description** TC is a Native American owned micro-enterprise in a medium size city of the metropolitan area. They serve over 90 tribal and Native American health service clinics in 15 states. It was founded in 1993, the store provides full service, discount eyeglass program. The owner of this business is a Native American in his 60s. Usually he sends and receives emails desktop to remotely communicate with other employees. Since most of the business and transactions are conducted offline, the owner does not need to worry about information security issues. The owner has a website to demonstrate the product online, it is also outsourced to a third party.

According to the interview and observation, the owner was very open to the use of Information Technology. He outsources the majority of the IT-related work since he is not familiar with infrastructure and information security. The owner also has a smart phone that help him stay tuned for business communications. However, he finds it extremely difficult to use the smart phone. During the initial meeting, he was only able to make phone calls to business partners. However, he did not know how to send text message, check email, and check documents from the smart phone. The owner has very limited knowledge in using the cloud based service such as Dropbox and Skype. He also expressed the need for fully utilizing the functions and features provided by the smart phone. Those limited knowledge hinder the development of the micro-enterprises since he could not get updated information if he does not have access to his office computer.

**4.2.2 IT Intervention Fully Utilize Smart Phone:** The only function of the smart phone that owner utilizes is making phone call. The owner has very limited knowledge in sending text messages to employees from the smart phone. Owner does not know how to receive/send emails, and utilize other cloud based service.

Establish Cloud Based Service For Communication: Skype and iMessage. TC owner wants to utilize different cloud based service so that he can connect with his employees and other business partners when he is traveling. Even most of the business and transactions are processed offline in distributed locations, it becomes essential for the owner to take advantage of the cloud based service to communicate with others. During the interventions, owner expressed that it would be great if he could choose to use the service for free. Skype is identified as the first appropriate cloud based service as it provides both desktop and smart phone version at no

cost. iMessage is identified as the second cloud based service for communication as owner can send and receive message via smart phone at no extra cost.

Establish Cloud Based Service For Data Sharing: DropBox. DropBox can be a powerful tool for micro-enterprise and it is identified during the intervention as appropriate technology for TC. Currently owner of TC heavily relies on document via email and have difficulty in managing and sharing different versions of the documents like contracts and receipts. Dropbox provides web version, desktop version, and smart phone version for business owners. The drag and drop feature provides additional ease of use and does not require IT knowledge and appears to be a good fit for the micro-enterprise.

Research a method to manage contacts in the smartphone: Owner has about 300 contacts in the smart phone and does not know how to identify and backup those information. iCloud is identified as free service so that owner can backup those contacts information. Owner of TC can also restore all contacts information from iCloud if the smart phone is lost. Owner does not know how to quickly identify and search for a specific contact in the list by using alphabetical order built in the smart phone. Training for managing contacts in the smartphone is identified necessary for this micro-enterprise.

**4.2.3 Observations** Owner of TC was passionate about those interventions at first. After the first intervention, which was conducted at owner's office, the initial need was identified and further explained to the owner. The first intervention identified different types of available cloud based service and several recommendations for optimizing the smartphone. He appeared to be very satisfied about the interventions and asked for the second intervention.

The second intervention was conducted at researchers' office where both Dropbox and Skype accounts were created. After signing up for both service, basic training was provided to further help owner get familiar with both service. Owner was able to upload the documents and pictures to Dropbox and to use the Skype.

Training section for managing contacts in the smartphone was conducted during the second intervention. Researchers spent about 45 minutes to help TC owner understand basic features in the smartphone and different ways to back up the smartphone. He really liked the training since originally he has to visit service provide and take a training course at extra fees in order to get familiar with those features.

**4.2.4 Outcomes** Overcame fear of technology: During smart phone intervention, TC owner demonstrated that he was able to overcome the fear of

technology that he had to operate the smartphone. He was afraid he would break the phone and have to spend a lot of money in order to get it fixed. However, after the intervention, he appeared to be very confident about the smartphone and different cloud based service.

Eagerness to learn: From the first session, TC was always eager to learn. TC also requested for the second training after the first session.

Improved attitude towards IT adoption lead to IT acquisition: After TC was able to fully utilize the smartphone, he became more positive towards using the technology. At the beginning of the interview, the owner does not think that IT can largely improve the business. However, after the second intervention, TC believed that IT adoption not only leads to better business performance, but also the empowerment of his own life.

### **4.3 Micro-enterprise without IT interventions: RI**

**4.3.1 Case Description** RI is a Native American owned micro-enterprise in a small city adjacent to the metropolitan area. They provide different Native American gift services, including Native jewelry, artifacts, and Minnetonka moccasins. The owner of the store is a middle-age Native American woman. The store is highly engaged with the local Native community. Twice weekly, the store offers Native American embroidery courses. Serving as an information hub for the local communities, regular customers contribute to the majority of the sales.

The store faces shoplifting challenges due to the lack of employees. However, the owner is willing to invest in alarms, cameras, and monitors. The Information Technology greatly reduces the issue. The owner purchased a personal computer and an iPad to better control the stock of the store. There is no website for the store. But the owner does have two Facebook pages to better communicate with the customers and local communities.

**4.3.2 IT Intervention** The owner of RI was not willing to accept new technologies since she considered the existing technologies were sufficient. She spent about \$1000 for the alarms, cameras, and monitors. However, she was not willing to accept new technologies even some of the cloud based service were free. As the solo owner of the store, she could have invest her time and resources in some free technologies and service like Dropbox and Skype. But after she purchased the iPad and personal computer, she was not willing to further utilize the service.

**4.3.3 Observations** Two visits were conducted to RI. The first visit provided the owner an overview of

the existing technologies she had, and identified several potential services and technologies for future considerations. The second visit further identified different services that can be applied to RI in the future.

**4.3.4 Outcomes** Cloud based service was not carried out during the two visits. However, according to the observations, RI is highly connected to the local community. Cloud based service might be appropriate for future consideration.

## 5. Analysis

In order to understand the role of information technology in the development of micro-enterprises, this section offers an analysis of the three cases studied. For each of the cases we identify technology and training interventions, observations and outcomes that are most apparent. These are illustrated in Table 2 as follows:

**Table 2: Multi-Case Analysis**

MC	Interventions	Observations	Outcomes
PI	EBay for purchasing, Facebook and Google Docs for CRM	After three technology and training interventions, the MC owner was excited to adopt the technology as it was free.	Overcame fear and eager to learn mobile apps to connect with customers
TC	Smartphone utilization and learning, Communication services through skype and iMessage, data sharing using Dropbox	Three technology and training interventions took place. The MC owner was passionate about the training as it fits his business needs and was free.	Overcame fear of technology, eager to learn, improved attitude lead to additional IT acquisition.
RI	None	After having spent on technology, the owner was not willing to use it.	None

The two micro-entrepreneurs (PI and TC) who received technology and training interventions experienced some clear outcomes. These cases reveal concepts that are unique to the micro-enterprises operating in low resource environments. These outcomes from successfully using technology through training led them to experience overcoming fear of technology, eagerness to learn once they were able to see the benefits of these specific interventions for their business. This lead to improved attitude towards technology and additional IT acquisitions.

The micro-enterprise that adopted IT but did not go through technology and training interventions targeted to their business needs, did not illustrate any outcomes. Given that information technology has become pervasive and adoption in and of itself is no longer a challenge, it is these outcomes offer more specific ways in which contributions can be made.

## 6. Contribution and Conclusions

This paper has offered a contribution at the intersection of the IS research and ICT4D fields. We have investigated the role of information technology in the development of micro-enterprises by analyzing case studies of technology and training interventions in three Native American micro-enterprises. It is clear from this analysis that micro-enterprises seek outcomes beyond simply adopting information technology. Further research can study the outcomes identified in this analysis in additional micro-enterprises operating in low resource environments. Such concepts can be studied to offer contributions that can make a better world. They can also be used to support policy makers who design interventions for micro-enterprises in low resource communities.

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