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ABSTRACT

While the process by which Information Technology enables growth in medium and large enterprises has been well-researched, the corresponding processes in micro-enterprises are poorly understood. In fact, such micro-enterprises lie at the heart of many economies. This insight is important as information technology enables businesses to connect with each other through knowledge networking to carry out their basic business operations. There is thus a need to build our understanding of how micro-enterprises access and use technology in order to be able to assess the benefits they derive from ICT adoption. Following an analysis of two case studies of Latino micro-enterprises using Sen's capabilities model, this paper uncovers the ways in which Latino micro-enterprises adopt information technology to grow their businesses in terms of their means, ends and freedoms. The contribution of this paper is to what we know about how Latino micro-enterprises adopt technology. This adds to our body of knowledge on challenges facing Latino micro-enterprises in the U.S. (an important subgroup within the under-researched area of micro-enterprises) and how such businesses may adopt ICT to benefit and grow their businesses. This has implications for global development in enabling adoption by microenterprises to be investigated, and in enabling techniques to be developed and deployed to improve the ability of micro-enterprises to adopt ICT to grow their businesses in ethnically cohesive communities.

Keywords

Micro-enterprises, ICT Access, ICT Use, Capabilities, Amartya Sen, Social Constructivism

INTRODUCTION

Technology adoption and usage have been researched thoroughly in the context of large organizations (Venkatesh et al. 2003). Such organizations tend not to suffer from the same challenges as smaller and medium-sized enterprises (SMEs) as they can access, almost by definition, more resources. Similarly, technology adoption has also been researched in the SME context, with, as one might expect, many challenges being uncovered (Schreiner et al. 2003) (Lichtenstein et al. 2001) (Piscitello et al. 2004). Micro-enterprises may serve as the main driver of economic expansion in poverty-stricken communities, and represent about eight-seven percent of all businesses to begin with (Qureshi et al. 2009) as well as the basis of potential industrial expansion in the developed world (Grosh et al. 1996). However, these businesses with one to five employees have been neglected by both policymakers and the IS literature (Gillard et al. 2007; Hollifield et al. 2003; Schreiner et al. 2003; Wolcott et al. 2007). Such businesses suffer from challenges even more severe than those of SMEs (Servon et al. 2000; Wolcott et al. 2008); the most deprived businesses are simultaneously the least understood. They are important because an understanding of ICT adoption in micro-enterprises can be generalized across different communities in different parts of the world. This would mean that insights generated from this study could potentially be compared to those produced within developing economies.

Efforts are underway to promote the development of the ICT industry in Latin America (Ania et al. 2007; Chudnovsky et al. 2005). The expectation is that such ventures will foster economic and social development via the provision of ICT support, skills, infrastructure, and so on (Arocena et al. 2003; Huerta et al. 2007). Nonetheless, these programs lack a firm conceptual foundation. It has been posited that ICT adoption is driven by changing informational requirements (Street et

al. 2004), the need to improve existing practices in the face of competition, and by proactive technology-oriented managers and consultants, although growth arising out of ICT adoption may be inhibited by time, resource and skill limitations (Cragg et al. 1993; Iacovou et al. 1995; Sadowski et al. 2002). Some researchers frame ICT Adoption largely in terms of social norms and individual perceptions that interact to produce an 'Intent to Adopt' (Riemenschneider et al. 2003). Others describe ICT Adoption as an optimization problem along the axes of firm level strategy and customer demands (Levy et al. 2001) (Levy et al. 2002).

While the plurality of businesses in Latin American communities around the world are micro-enterprises, little research has been carried out with respect to discovering how these businesses may adopt technology and if they at all benefit from using it. As Qureshi and York have pointed out, business owners/executives are influenced by the ethnic norms that reign in the community where their micro-enterprises operate (Qureshi et al. 2008b). Of particular concern is the rapid increase of the Latino population absent a corresponding increase in research on ICT use in Latin-American micro-enterprises (Pick et al. 2007). Already, there is evidence that Latino micro-enterprises face some unique ICT-adoption-related challenges. For instance, Huerta and Sandoval-Almazán (Huerta et al. 2007) show through the study of Telecenters in Mexico that users had problems in navigating websites in a non-linear manner and in assessing the validity of information on the web. Research efforts on ICT Adoption by large Latino enterprises are underway (Gómez de Silva Garza et al. 2007); the same cannot be said for studies of Latino micro-enterprises. Recent research has shown that Latino micro-enterprises in the US are also faced with similar challenges. In their study of Latino microenterprises in a part of Omaha, Qureshi York (2008) found that the challenges of limited knowledge, language, lack of training and skill sets made it very difficult for micro-entrepreneurs to adopt ICTs. In particular, the fear of losing control as a result of losing technologies brought about a mismatch between the training they received and the ethnic norms in which these minority and ethnic businesses were embedded. At the same time the potential opportunities motivated some entrepreneurs to adopt the technology. In particular, a process called ICT therapy was applied in context of business activities to enable microenterprises to adopt technologies to grow their business. In a study by Dinges (Dinges 2008) who tested Qureshi York's model, these micro-enterprises appeared to exhibit a greater degree of 'perceived usefulness' attitudes toward ICT as a result of the ICT interventions.

This research goes a step further in exploring the adoption of ICTs by Latino micro-enterprises by investigating the research question: what are the ways in which Latino micro-entrepreneurs adopt ICTs to grow their businesses? This question will be investigated through a set of case studies of Latino micro-enterprises in Omaha. The micro-enterprises were selected to receive technology and training interventions based on need. The outcomes of these interventions were assessed based on a set of concepts derived from Amartya Sen's Capability model. This theoretical lens is developed in the following section and used to analyse the results from the case studies. Following an analysis of these cases, this paper contributes to what we know about how Latino micro-enterprises adopt technology to grow their businesses.

THEORETICAL BACKGROUND

Recent studies have shown that traditional models of technology acceptance (TAM and UTAUT), do not adequately explain technology adoption by micro-enterprises— partly on the basis of observed outcomes in which micro-entrepreneurs' theoretical appreciation of ICT benefits did not result in actual adoption behaviors, and partly as a result of conceptual objections to the applicability of theories requiring deeply hierarchical social structures and corporate cultures to flatly structured micro-enterprises employing a handful of individuals (Wolcott et al. 2007) (Qureshi et al. 2008a). Micro-enterprise technology adoption behavior is unique not only because micro-enterprises comprise the majority of businesses in the developed world (Qureshi et al. 2009) but also because micro-enterprises have been shown to anchor under-developed communities, to contribute to technology diffusion processes in ways that large businesses do not, and to provide uniquely flexible work opportunities in the face of various situations involving deprivation (Gillard et al. 2007; Hollifield et al. 2003). Inherently, the study of entrepreneurship is interesting because entrepreneurship is believed to serve as the basis for industrialization (Grosh et al. 1996). Micro-enterprises from different communities and cultures around the world share many of the same challenges (Wolcott et al. 2008), although there are important differences driven by socio-cultural variations (Qureshi et al. 2008b).

Enabling the capabilities of *Latino* micro-enterprises is important because the population of Latin America is projected to boom to 700 million by the year 2025 (Pick et al. 2007). Though the strong cultural similarities among groups in Latin America would appear to recommend a pan-Latino ICT-related research agenda, no such strategy has emerged (Borges et al. 2000). The patchwork of ICT studies undertaken has uncovered some tangible benefits from ICT adoption (Gómez de Silva Garza et al. 2007) as well as a degree of resistance to ICT (Joia 2007) and unique Internet usage challenges (Huerta et al. 2007). Specific Latino business related issues meriting further investigation include but are not limited to the challenges facing micro-enterprises and their unique needs as part of a distinct cultural identity (García-Sánchez et al. 2007) (Qureshi et al. 2008b). Latino business owners/executives, as some business executives in certain countries in Asia, tend to make

decisions based on tradition, experience and intuition (García-Sánchez and Pérez-Bernal, 2007). The challenges that apply for the Latino community when applying ICT in the enterprise setting (Huerta and Sandoval-Almazán, 2007; García-Sánchez and Pérez-Bernal, 2007; Qureshi and York, 2008) are as follow: Business vision and plan is not a critical success factor for the business owners, decision making is approached based on experience, tradition and intuition, business owners have limited knowledge of technology, business owners lack training and skills, business owners have language constraints, owners fear losing 'control' as a result of using the technology, mismatch between standard teaching technique and business owner preferred learning style, ethnic and social-network related norms disfavoring ICT use.

As a means of understanding the context within which access and use takes place, Sen's 'capability model' enables the key conditions and outcomes to be identified. This is a high-level conceptual framework that can be applied to evaluate the well-being of both individuals and groups. The assumption on which the capability model rests is a view of 'freedom' as, to quote Sen: "(1) the primary *end* and (2) the principal *means* of, development." In Sen's view, freedom of action, or a person's ability to pursue what he/she perceives as valuable, tends to lead to social benefits. Sen offers up descriptions of broad categories of 'instrumental' freedom that contribute to individual freedom (and thus potential prosperity); Instrumental freedoms can (and will) be assessed at the individual level, but are primarily *operated* upon at the level of government policy. Instrumental freedoms represent one set of *means* by which the *end* of development is achieved (Robeyns 2005). Sen refers to the choices individuals *make* in a given context as individual 'functionings.' The *possible* choices available to individuals are referred to as 'capabilities.' Sen recognizes that individuals will not always make the best choices, but adopts the normative perspective that society should permit individuals the range of choices that will allow them to best approximate their goals. Sen describes the 'available choices' in terms of inputs moderated by the individual's goals and abilities (conversion factors). The choices actually made are described as 'achieved functionings' in contrast to the super-space of 'potential functionings' synonymous with capabilities. Instrumental freedoms broadly circumscribe the individual's capabilities, but other inputs (such as available resources, income, etc.) also play a role in shaping what is possible in a given situation.

A basic insight arising out of Robeyns (2005) discussion is that Sen's model is well suited for conceptualizing the barriers that individuals face in achieving their goals. If these barriers are lowered or removed, then the prospects of achieving development are improved. A corollary is that policies that remove obstacles are judged to be 'good,' depending on whether the obstacles bear on the capabilities of interest to society. Of course, to describe particular capabilities as more interesting or desirable than others is to enter a realm of protracted academic debate. Sen himself offers no opinion, preferring to leave such descriptions to 'social consensus.' As a practical matter, 'desirable' lists of capabilities for social justice have been filled in by Nussbaum, and other kinds of desirable capabilities are being proposed by researchers attempting to operationalize Sen's model in various domains (Des 1997; Robeyns 2006). One aim of the research undertaken in this paper is to define some important ICT-related capabilities that may be enabled for Latino micro-enterprises. Sen's definition of capabilities as 'freedom of action' permits him a pithy definition of poverty as 'capabilities deprivation.' Poverty, in Sen's frame, is not 'low income' but rather a description of an individual's inability to function at a desired level relative to others. Scrutiny of poverty or poor individuals or groups, therefore, entails an examination of the instrumental freedoms, inputs and individual conversion factors that play a role in constraining individual freedom of action.

The means of ICT adoption relies on the end of ICT infrastructure. ICT adoption (also known as ICT Use) has been shown to enable greater per-capita productivity (Benoit et al. 2002; Kosempel 2007), although individual conversion factors (specifically, those related to attitudes) are understood to significantly mediate productivity gains (Dijk et al. 2006). ICT adoption has also been correlated with profits at a national level (Dewan et al. 2000), and at a firm level (Barua et al. 2004). ICT adoption is not interesting purely from a *financial* standpoint; it has been suggested that coupled with extensive channel support that ICT adoption holds promise as a means to promote *sustainable* development in the developing world (van Rensburg et al. 2008) as well as *innovation* in the developed world (Sheehan 2006).

METHODOLOGY

Two case studies are investigated in this research. This research was carried out as part of an initiative called "eTeams" at the University of Nebraska, Omaha. eTeams are cross-disciplinary, student-led teams that assist micro-enterprises in using ICT to grow their businesses. The case studies assess the effects of ICT 'interventions' that are carried out by 'ICT Therapists' who administer customized solutions to address very specific business problems. The ICT Therapists administer these solutions (means) through training, trust building, and technology implementation. The outcomes (ends) of these interventions are measured in terms of economic, social, and human development criteria. The training of ICT Therapists began in 2006 with the IT for Development course offered in the College of IS&T. These ICT Therapists became part of eTeams in 2007 when funding was secured for them through the NU Foundation. Further description and discussion

on this process can be found in Qureshi et al (2009). While the full action research process took place in the project, this research focuses on the outcomes of the ICT interventions within two case studies.

The case study method of analysis is appropriate for the study for reasons closely aligned with Yin's definition and discussion. The study meets Yin's (2003) requirements for a good case study. With respect to construct validity, we note that our method involves conducting formal (pre and post interaction) interviews with subjects covering concepts grounded in the literature. The questions were designed and validated by a team of researchers experienced in qualitative research in IS, and approved by an institutional review board. Some of the questions are open-ended, so as to permit the subject to explore contextual issues that are difficult to anticipate and/or operationalize beforehand. We supplement our formal interviews with note-taking on subject/researcher interactions that is regularly reviewed during the process of ICT Therapy. This process involves a diagnosis of the business problem, identification of alternative solutions, implementation, and evaluation.

We chose South Omaha as a site for this study because its population is Latino. From within our site, we selected businesses that were micro-enterprises according to the criteria that they employed between one to five people and earned a low relative income (less than 25,000 US Dollars per annum). We transcribed our initial and final interviews with these businesses and took notes on our informal interactions along the way. We conducted interviews with two of our subjects in Spanish, and one of our interviews in English (at the request of the interviewee). Our ICT-Therapy program for each business lasted approximately five months. The ICT-Therapy interventions were undertaken by students. The second author of this paper conducted two out of the three interventions personally, and worked on aspects of the third. All three interventions were supervised by the first author of this paper.

Our data was collected and analyzed using qualitative interpretive means. This mode befits an exploratory study (we lack sufficient information to create informative quantitative measures or testable hypotheses) and aligns well with Sen's capabilities model, which explicitly and implicitly recognizes the importance of social construction of meaning, the latter construction being a premise of interpretive research (Sen 1999) (Klein et al. 1999). An oft-repeated criticism of qualitative interpretive case research is that it buries the reader in detail. To an extent, we side with Dyer (Dyer Jr et al. 1991) in that we would argue that *stories* enrich our understanding of situations. We highlight important facts and concepts using easily understandable tables and diagrams.

RESULTS AND ANALYSIS

The two case studies are reported and analysed in this section using Sen's capability model and we consider how well outcomes facilitate aspirations (Zheng 2009); we are concerned with how our ICT interventions in the areas of access and use improve the micro-entrepreneur's well-being. Pursuant to Sen's capability model, the cases are analysed in terms of the micro-enterprise owner's goals, means, needs and the capabilities enabled as a result of the customized ICT interventions carried out by the ICT therapists.

Case 1: PN, Mexican Bakery

The pastel-colored PN Mexican-American bakery sits in the heart of South Omaha; it is one of two such bakeries within walking distance from South Omaha's residential neighborhoods. Its regular products include bread and pastries. PN's specialty lies in designing attractive and structurally complex cakes for special occasions, such as 'sweet fifteen' parties, birthdays, weddings, and family gatherings. PN has been operating since 2002, and has won awards from organizations such as the Hispanic Chamber of Commerce, for both entrepreneurship and product quality. PN is owned by a Mexican-American immigrant, AM. AM originally worked temporary construction jobs before learning the craft of baking from his brother, who had set up a bakery in Pennsylvania. When he felt he had saved up enough money from his construction work, AM moved to Nebraska and incorporated his own bakery. He employs four individuals, including another brother. Two of his four employees are full time. AM works 60-80 hours a week baking and managing the other employees. His business has been consistently, though not tremendously, profitable. Its success at all is particularly noteworthy given that AM possess only the equivalent of a second grade education. AM lives in a tiny apartment one block away from his business. After a full day of work, he will often return home only briefly before leaving for technology night classes at the local Juan Diego center.

Microenterprise Goals: PN's main ambition is to double the size of his shop so that it is less cramped and can accommodate a café section, along the lines of what is done at Panera. For that, he told us, he would need more money and better control of his business. We asked him to articulate what he meant by control, and he indicated that was interested in mastering technology as a means to better monitor his costs, manage his supply network, and monitor the performance of his employees. He expressed a desire to learn the QuickBooks accounting software so that he could perform accounting functions rather than outsourcing said functions to another entrepreneur. He also expressed a wish to learn PowerPoint so that he could market his business to investors and customers attending Latino-themed gatherings. AM was interested in the idea

of creating a website, but had little idea about what that might entail. Generally, AM said that he wished he could 'use Windows and the Internet better' so that he could stop wasting time on technical issues and focus on the core of his business.

Microenterprise Means: AM's net income derives exclusively from the profits earned by PN. He produces baked goods via his own labor and the labor of his employees. His baking equipment consists of industrial blenders, ovens, and refrigeration units. AM owns an obsolete desktop computer that sits in PN's back office. At the beginning of our intervention, he had one primary supplier for flour and other materials. He communicated with that supplier via lists of 'goods required.' In terms of services, PN received heating, electricity and telephone services from standard Omaha area providers. PN has Cable Internet service, and AM has Cable Internet service at home. PN outsources its accounting services to another micro-enterprise. PN has no legal counsel; AM approaches free legal service centers when the need arises. Table 5, below, depicts the goods and services that act as inputs to AM and PN.

Goods	Services
Baking equipment (blenders, ovens, refrigeration units)	Heating, Electricity, Water, Phone
Baking materials (flour, sugar, etc.)	Cable Internet (Home and Work)
Desktop computer (Windows 98)	Accounting (Outsourced)
	Legal (Volunteer Groups)

Table 5: Goods and Services that Act As Inputs on PN

AM had received no individualized technical assistance, nor did he have any friends or family with computer skills. He was taking Excel classes at the Juan Diego Center at the time we first met him. He commented that he used the Hispanic chamber of commerce as an aid for establishing business relationships. AM did not, to the best of our understanding, have outstanding business loans, or ongoing relationships with a financial institution outside of a business checking account.

Micro-enterprise needs: AM was skilled at running his business using only pen and paper. Practically speaking, he had decent control of his employees and costs. From a human standpoint, AM possessed demonstrable ambition, discipline, and time management skills. ICT-wise, he had an extremely basic mastery of Windows, Excel, and Internet Explorer. Socially speaking, he had achieved a moderate degree of success connecting to the Hispanic community, mostly through his participation in the Hispanic Chamber of Commerce and via word-of-mouth generated by his novelty cakes. Economically, he was maintaining a standard of living that was not luxurious but rose above subsistence level; he had savings and limited discretionary income. AM's primary handicap was his limited comprehension of, and ability to communicate using, English (This was particularly problematic given that AM's only computer was configured to use English versions of both Windows and Microsoft Office). AM lacked knowledge about, and the ability to use, common software. Finally, he lacked time to devote to building his linguistic and technical skills. The three aforementioned deprivations in combination made it very difficult for AM to learn new technology or business skills, expand his social and business network outside of the Hispanic community, or access financial resources that might help him grow his business operations. From a social standpoint, AM suffered from a deprivation in terms of his (lack of) access to Spanish-speaking individuals who could offer him personalized technology advice or assistance. Essentially, AM exists in a community that is not very technology savvy. Though AM found skills training programs helpful, these programs were not adequate for his individual needs. Relatedly, from an economic standpoint, AM needed a mobile computer to run PowerPoint and upon which to practice his skills; although he possessed the funds to upgrade, AM could not turn to anyone for advice on what to upgrade to.

ICT Interventions (Role of the IT Therapist)

The ICT therapists in this case felt that AM's primary technologically addressable need was in the social sphere. They believed that improving AM's ability to communicate outside of his community and existing supply chain would be crucial for him as he sought to gain better control over his business. Part of the goal of the intervention was to increase *AM's* ability to connect with others on his own. This was accomplished through training AM on PowerPoint, web search, and email. The other part of the goal of the intervention was to make it easier for *others* to connect with AM. This part of the goal entailed the creation of a website that would present AM and his business in a favorable light, and that would be readily discoverable by search engines. Table 9, below, describes the interventions performed, alongside the relationships that the researchers *perceived* as existing between a given intervention and the micro-entrepreneurs goals and deprivations.

ICT Intervention	Goal(s) Addressed	Needs Addressed
Laptop purchase (Access)	Improved marketing of business, Mastery of basic computer skills	*Underpowered, immobile computing hardware*

Installation of Spanish-language versions of software (Use)	More efficient management of business	Poor English Skills, Lack of time
Training on PowerPoint (Use)	Improved marketing of business	Poor technology skills
Training on email usage (Use)	Supply network management	Poor technology skills, Limited ability to expand business network
Creation of basic website (Access)	Improved marketing of business	Limited ability to expand business network
Training on maintenance of website (Use)	More efficient management of business, Improved marketing of business	Poor technology skills, Poor knowledge about technology
Training on basics of web searching (Use)	More efficient management of business, Poor technology skills	Limited ability to expand business knowledge

Table 9: ICT Interventions in light of Goal and Need Considerations

Capabilities Enabled

AM indicated in his evaluation interview that he had benefited greatly from the ICT intervention; we consider his case an unmitigated success. The purchase of a laptop enabled AM to devote downtime at work to practicing his skills. He would, for example, send 'dummy' emails to our ICT therapists to improve his confidence with the email client. We believe that he will be able to take the laptop to class with him, which will hopefully not only further improve his confidence but allow him to pose questions about concrete work problems directly to instructors, as he will have all the information related to the problems in front of him.

AM had experienced particular difficulties with his original Windows machine as all of the software, including the operating system, had been installed in English. Error messages would pop-up, and AM would find himself completely unable to interpret them. The strange messages coupled with the red 'boxes' associated with the typical error message had heightened his fears and decreased his sense of control over the original machine and operating system. He told us that he had felt before that if something went wrong, or 'broke' he would be completely unable to fix it, and that this had greatly lessened his willingness to use that machine for anything. Installation of appropriate software allowed AM to experience software packages as he had learned them at the Juan Diego Center— with a Spanish interface, error messages, dialog boxes, etc. AM was very enthusiastic about Spanish language Internet Explorer; he had used the English language version so infrequently that using the Spanish version felt to him, like surfing the Internet for the first time. We believe that AM's use of the Spanish language software opens up the potential for him to gain a better conceptual model, overall, of software function, and ultimately, for him to solve his own problems.

This micro-entrepreneur received extensive instruction on PowerPoint as part of the ICT intervention. Although he expressed gratitude for this instruction, we did not see tangible benefits during the course of our ICT intervention, arising out of his usage of it. The instruction did seem to 'demystify' the application for him; he stated that he is more likely now to take formal classes related to it in the future. It is our belief that we have enabled the potential for AM to use PowerPoint in his marketing. AM had some trouble typing, so our ICT therapists gave him typing practice exercises that required him to write simple emails to them. As we will discuss in a subsequent paragraph, we had no idea how significant AM's use of email would prove to be when coupled with his Internet search training. AM lacked a web presence. We felt that building a website for him using WordPress would offer him a good value in connecting to members of the Hispanic and English communities and in marketing his business. Certainly, the design process, the necessity to make a pitch, and have overriding themes made AM more aware of his business' focus, as well as its strengths and weaknesses. We anticipate that, at business-related social gatherings, AM's website will enhance his standing in the community. Already, he told us, he has undertaken to redo his business cards and the paint job on his delivery truck in order to highlight the website. We trained AM on updating the site; we feel that this improved his sense of control over his business.

Something unexpected occurred as a result of our training of AM to use Internet search and email messaging. On his own, as we learned in our evaluation interview, AM had begun a regular practice of researching commodities suppliers (flour, sugar, frosting, etc.). When he found suppliers that he liked, AM would email them requesting further information, discounts, and so forth. In several cases, AM had the providers compete with each other for his business. This whole process resulted, according to AM, in cost savings of fifteen to twenty percent and significant quality improvements compared to his previous business practice of using a single supplier. AM also independently began a program of researching trends in Mexican consumer preferences. He sought out imagery of cake constructions from prominent Mexican bakeries and by the time of our interview, had begun using these as inspirations for innovative new product designs. As AM's word-of-mouth marketing had been built largely around his elaborate cake constructions, it is hard to overstate the significance of his using the Internet to generate ideas for even more impressive cakes. As well, AM told us, when he encountered design issues (lack of particular

cake toppers, for instance), he could now find suppliers located in Mexico. AM indicated that he would email said suppliers with his orders, and arrange payment over telephone; he said that he did not trust or understand e-commerce in the form of online checkout, etc.

Needs Remaining: Although we feel that AM achieved great success in a short amount of time, we were unable to help him significantly improve his English language skills directly or indirectly. In fact, slightly over half of our interactions with AM were purely in Spanish. AM commented that he was running a bakery 'for Hispanics;' we get the sense that he still lacks meaningful ties to the mainstream Omaha community. Although we hope that his newfound facility with the Internet assists AM in reading English, the only English-language websites he visited routinely were those of suppliers. His research of trends in consumer preferences and with respect to cake designs was conducted in Spanish, through Spanish-language Google. Financially speaking, AM is better off now as a result of his own ingenuity coupled with our training interventions. We hope that his website and his continued innovation will allow him to expand his business network further, but that is far from a given. Finally, we could not offer AM any assistance in managing his employees using technology

Case 2: EA, Mexican Restaurant

The green awning of the EA Mexican restaurant has been a fixture of South Omaha's Latino community almost from the community's inception. It was the first Mexican restaurant to open in South Omaha; its food is both delicious and uncompromisingly down-home and authentic. On weekdays during lunch hours, a fairly even mixture of Omaha natives and Mexican American immigrants populate the restaurant. Their chatter, in English and Spanish, is punctuated by the 'dings' of the ancient cash register, and the occasional thump of passing car stereos pumping bass-heavy Mexican rap.

EA is owned by a Mexican-American immigrant, IC. IC got the idea of starting a restaurant after his brother opened up a successful restaurant-supply wholesaler. EA's example, has, for better or worse, inspired a raft of competitors; it has also earned IC a fair amount of recognition – he has been mentioned in the Omaha World Herald, and even, in passing, by the New York Times. EA employs seven people, of whom four are full time employees. Unfortunately, EA is more well known than financially successful; IC suggests that with the recent cold weather in Omaha and the general economic malaise, he is 'just barely scraping by.' Both IC and his wife work long hours at the business; IC joked that they 'might as well live there.' Unlike AM in our previous case study, IC speaks moderately fluent English.

Micro-enterprise Goals: IC's primary ambitions are to: have better control over his business, attract more customers and to raise his quality of service for existing customers. During better times he had doubled the size of the restaurant by purchasing an adjacent structure and connecting the two halves. Now, the 'older' half sits largely unused. Still, when EA does get busy, its creaky processes hinder fast and accurate service. Taking orders involves the wait-staff translating English to Spanish for the benefit of the moderately illiterate cooks, on handwritten order sheets that must be ferried back to the kitchen, and preserved after customers are served (the sheets double as the checks); mistakes are aggravatingly common. We asked IC to elaborate on his ideas of better business control, and he indicated that, for one thing, he was interested in being able to supervise his employees more closely, which would be facilitated if he could worry less about basic issues like ordering and receipts. He felt that, from a resource standpoint, he was ordering supplies 'based on intuition' rather than a good sense of, for instance, how much ketchup EA was actually consuming in a given month. IC felt that the ordering process and the supply issue were related; he wanted to see which orders were most typical so that he could stock more of the corresponding supplies. He had heard that other restaurants used 'point of sale' systems connected to the kitchen and the supply room, and he was interested in purchasing such a system, but did not know where to start. IC expressed a strong interest in having a basic website, as a means of marketing his business, with its rich history, to English-speakers. Practically speaking, he felt that his staff's limited facility with English was costing the restaurant customers due to the staff's not being able to offer the best directions.

Microenterprise Means: IC is a salaried employee of his own business. His equipment consists of his restaurant buildings, and associated furnishings, as well as machinery for cooking. At the time we met him, he owned a very old, virus-infected, desktop computer. As this computer was unusable, he would routinely 'borrow' his son's laptop to check his email. IC had multiple suppliers of raw materials for his restaurant. He had his son place online orders from the suppliers' B2B systems as he did not feel comfortable doing so. In terms of services, IC received heating, electricity, and telephone services from standard Omaha area providers. He had Cable Internet at work but not at home. IC performed his own accounting using a paper system. In the past, he had received one-time business consulting advice from an area business school; he did not find this helpful so he requested no further services. He has no legal counsel, and does not have time to take technology skills classes. He said that he relied on his son to help him perform occasional Google searches and when any technical issues might arise. Table 12, below, depicts the goods and services that act as inputs to IC and EA.

Goods	Services
Restaurant equipment (furnishings, cooking equipment)	Heating, Electricity, Water, Phone

Raw materials (tomatoes, tortillas, etc.)	Cable Internet (Work Only)
Desktop computer (ten years old)	Technology (Informal help from Son)
Son's laptop computer	

Table 12: Goods and Services that Act As Inputs on EA

IC had received no individualized technical assistance, and his only technical resource was his son, who was often busy with school. He commented that he attended occasional seminars by the Omaha Chamber of Commerce. He maintained a catering relationship with the local Air Force base for certain special occasions throughout the year. He had a special relationship with his brother the wholesaler, meaning that he could get discounts on certain goods. He maintained a checking account with the local bank, as well as a large long term loan related to his acquisition of his restaurant's building.

Micro-enterprise Needs: From a human standpoint, IC was skilled at running his business using only pen and paper. Practically speaking, he had decent control of his employees and costs. He was making a modest living (above subsistence). He appeared to have some skill in maintaining long term business relationships (bank and Air Force). He spoke good English and could read and write basic English. He knew enough accounting to keep his own books. IC's primary needs were economic and human in nature. Much of EA's monthly income went to debt service for the EA building. As a result, IC indicated that he was using obsolete fryers, refrigeration units, and so on; he could achieve much greater efficiency if he could upgrade, but he lacked the capital to upgrade. EA's primary computer was so old as to be unusable with respect to the modern Internet or even recent versions of Microsoft Office. In service of attracting customers, IC expressed a desire to run regular newspaper advertisements, but lacked the revenue for that as well. We asked IC whether or not he had applied for additional business loans, and he indicated that he had and had been denied because 'banks around here do not trust Hispanic businesses.' Even though EA had been in continuous operation since the early 1990s, banks lumped it along with much newer South Omaha ventures in terms of risk. IC expressed frustration with the poor quality of infrastructure in South Omaha; he felt that South Omaha could be a 'destination' but that the city had not offered a good enough police presence to make it reliably secure. From a human standpoint, IC suffered from a lack of basic technical skills. He was not a competent user of Windows or Internet Explorer; he relied overly on his son with respect to technical concerns. As a result, he was unable to effectively build either his business or technical knowledge base. He could not research advertising strategies or equipment of interest (such as the point of sale system) on his own.

ICT Interventions (Role of the ICT Therapist)

As stated, the eTeams initiative views an ideal ICT intervention as one that addresses, to some degree, both the individual's deprivations and his or her goals. The ICT therapists in this case sought first to address EA's access problem by providing him with specifications for an affordable laptop. Similarly, they sought to specify a highly cost-effective Point of Sale solution that would help IC obtain better control of his costs (materials orders) and would minimize ordering errors. In the social realm, similar to what was done with PN, they sought to encourage outsiders to locate and connect with EA via the creation of a basic informational website tied to Google Maps. On the human front, the ICT therapists sought to increase IC's confidence using search engines so that he might begin to fill in some of his knowledge gaps independently from his son, and perform ordering activities by himself as well. IC did not explicitly mention 'improving his technical' skills as a goal, but the ICT therapists felt that his doing so would be necessary for his achievement in other areas. Table 16, below, describes the interventions performed, alongside the relationships that the researchers *perceived* as existing between a given intervention and the micro-entrepreneur's goals and deprivations. Note that the associations are not identical to the previous case, as a different group of therapists was involved in this intervention.

ICT Intervention	Goal(s) Addressed	Deprivation(s) Addressed
Affordable Laptop recommendation (Access)	Improved Business Control	Underpowered, immobile computing hardware
Internet search training	Improved Business Control	Poor knowledge about technology, Poor technology skills
Affordable Point of Sale Recommendation (Access)	Improved management of employees, resources, orders	Insufficient capital to perform necessary ICT upgrades, Poor knowledge about technology
Creation of basic website (Access)	Improved Advertising and Marketing, Increased Sales	Inability to access financial resources
Training on maintenance of	More efficient management of business,	Poor technology skills

website (Use)	Improved marketing of business	
Training on basics of web searching (Use)	More efficient management of business, Poor technology skills	Poor knowledge about technology, Poor technology skills

Table 16: ICT Interventions in light of Goal and Deprivation Considerations

Capabilities Enabled

IC indicated that the training and website creation aspects of the intervention were extremely helpful. He found web hosting fees affordable and was interested in web advertising in the near future. Unfortunately, IC's finances deteriorated during the course of the intervention to the extent that he found himself unable to afford the laptop or the point of sale systems that the students had researched for him (the total cost would have been approximately $1500). The students were understandably disappointed, as they had devoted a great deal of time to finding a solution (a wireless cash register and wireless order/receipt printer) that would have required minimal maintenance and would have offered the possibility of tracking resource consumption, etc. IC suggested that he would like to purchase such a system as soon as he can afford it, and we agreed to return for a subsequent evaluation in the event that he does so.

The purchase of a laptop would have potentially enabled IC to access information and knowledge on his own terms and improve his personal productivity. As it stands, the only outcome we measured was that IC felt, after we produced our research, that a laptop purchase would be much more feasible for EA. He viewed it as a realistic possibility (he had not before) and declared his intent to buy a laptop once EA's revenues stabilized. Similarly, the point of sale solution the students generated would potentially have made EA more productive and efficient, and might have saved time and stress and allowed EA to focus on core functions. As it stands, the most significant benefit that we assessed arose out of the students having walked IC through their thought process in comparing different systems. IC indicated a greatly increased awareness of the technologies, pricing points, and tradeoffs in the POS area during our evaluation interview. He also indicated a willingness to purchase a POS system in the future given the concrete value proposition on offer. The creation of a basic website will potentially grant EA increased access to new markets and sales. IC did not understand previously how cost effective both web hosting and web advertising can be, and he became very excited about the possibility of web advertising once he did. IC could not say whether the website had generated measurable increases in foot traffic when we spoke to him, because he was not in the habit of asking his customers questions about the web. IC did mention that he had trained his staff to refer customers asking for directions to the Google-maps linked portion of the website, and that several customers had successfully navigated to EA as a result.

Of all the interventions, training on search technologies seemed to offer IC the greatest benefit. The students walked through examples with IC involving searching for EA's name on the Internet. In the course of this process, they uncovered a number of reviews of EA (on such sites as Yelp, and the New York Times) that IC had been completely unaware existed. As a result, IC ended up posting quotes from several reviews on his website, and has become much more aware about how his brand is viewed. Interestingly, once we had trained IC, he ended up training his wife. He indicated that she was now conducting personal-health and business related searches on her own as a consequence of our training him. This was a good indication to us that IC found the training valuable.

Needs Remaining: This case (perhaps painfully) illustrates what the literature points out, that access to economic resources viz a vis ICT infrastructure is a prerequisite for ICT use. What is jarring is that, even though IC had (occasional) access to a laptop, his lack of ownership of the device caused him to lose his sense of control over the technology. Ultimately, while we improved IC's technology skills to some degree, they remain weak and are not likely to be developed unless IC takes ownership over technology. Similarly, while we were able to lower IC's 'perceived financial barrier to entry' with respect to certain technologies, we were unable to place these within easy reach. IC remains heavily in debt, and technology would not seem to offer any solutions with regards to his troubles getting business loans. Similarly, the security situation that IC described as problematic was not altered in any way by our interventions. While we are hopeful that IC will adopt the technologies we suggested in the near future, and we imagine these will provide significant tangible benefits, we do not foresee said technologies fundamentally altering IC's business situation in any way. Perhaps this is because, unlike AM, IC was already running a highly resource (if not time) efficient business.

CONCLUSIONS, LESSONS LEARNED AND FUTURE DIRECTIONS

This paper has reported on how Latino micro-enterprises adopt technology. In the case of the PN bakery, we helped AM achieve technology literacy that worked in service of his goal of better controlling his business. AM's future growth will be constrained largely, we imagine, by his English fluency and his access to and understanding of, the English-speaking consumer and the English-oriented banking industry. We assessed AM's needs as primarily social; our ICT interventions aided him in expanding his appeal to the Latino community and in presenting his business favorably. In the case of the EA

restaurant, we helped IC achieve increased technology literacy in service of his goal of better managing his business. We also created a web presence for IC that may help him increase his sales and market presence. EA's future growth will be constrained largely, we feel, by the economy and by his access to finance. We assessed IC's needs as primarily economic; our ICT interventions were tailored to offer him cost-saving efficiencies, but it is unclear whether he will be able to adopt our recommendations. We have agreed internally to review this case in three months, and we will add that data to the final version of this case study.

Overall, the most important capabilities enabled by these interventions related to access to information and knowledge. The simple act of teaching these businesses how to perform effective web searches seemed to afford them the ability to discover opportunities in ways that the ICT therapists did not anticipate: AM used information to reduce his costs, and IC used it to better understand his brand and how it was viewed by customers. Conveniently, the search intervention is low cost and comparatively easy to perform. The website creation intervention we performed seemed to facilitate these businesses' self-awareness (and potentially, standing in the Latino business community) more than their immediate access to new markets. We observed that these two members of the community lacked crucial knowledge about the affordability of websites (and web advertising). It is likely that if this knowledge were more widespread, that more Latino businesses in South Omaha would be willing to launch websites.

Lessons learned from this study are Latino micro-enterprises may have misconceptions about the capabilities of the modern Internet and modern computing hardware because they do not follow standard five year upgrade cycles and are using antiquated equipment as a result. The importance of having a native Spanish speaker during ICT interventions in this community cannot be overstated. A native speaker makes Latino micro-entrepreneurs (who are often embarrassed about their English skills) vastly more comfortable in expressing themselves in the knowledge that they can resort to Spanish if English fails; building familiarity and rapport is as crucial to these interventions, if not *more* crucial, than any single technology artifact.

Future research should consider the social networks within the immigrant communities and how these connect if at all to the rest of the population. The products of the two businesses seem little known outside of the Latino Community. Studies that investigate the uses of other media by Latino micro-enterprises such as using the web, television advertising, and other ICTs to capture new markets and achieve competitiveness would be valuable. Future research should develop instruments based on the framework offered in this paper to allow the role of community and affiliations in determining ICT outcomes for Latino micro-enterprises to be investigated.

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