

Research Article

The Making of Survival. Technology, Literacy, and Learning in Two Microenterprises in Mexico City

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Abstract

This article presents a portrait of how the owners of two informal microenterprises in a poor urban neighborhood integrate several digital devices into their businesses. We explore how they learned to use diverse technologies, transformed their production processes, and developed new products and services. We contend that while ICTs did not lead to expansion for the businesses, ICTs were vital to staying in business.

Keywords: new literacy studies, appropriation, microenterprise, poverty, technology, development, literacy

Researchers studying the use of information and communication technology (ICT) in less developed countries have paid considerable attention to its connection to development. A prevailing view among policy makers is that technological innovation will increase a country's "competitiveness capabilities in a global free market" (Avgerou, 2010, p. 2) by improving access to global markets, kindling product development, providing more and better information, and strengthening networks. Based on this belief, many governments and international agencies promote distribution programs, assuming the availability of the Internet and digital devices will enhance economic growth and improve the wellbeing of the poor (Galperin & Viencens, 2017). While scholars also recognize the potential ICT offers for development (Chew, Llavaran, & Levy, 2010; Clarke, Wylie, & Zomer, 2013; Duncombe, 2006), they carefully warn against believing that it is the solution for solving the historical, social, political, and economic problems poor countries face or that it is a means for advancing them quickly to "modernization levels of industrial societies" (Morales-Gómez & Melesse, 1998, p. 2).

ICT is the usual abbreviation for information and communication technology in the singular, lumping together multiple processes, devices, uses, and software. As a result, the plurality of technology—technologies—can go overlooked in policy statements, research or programs. Beyond the complexities of placing computers in remote rural communities or following the dispersal of mobile phones, identifying how people learn to use these technologies is essential for understanding the everyday side of development. This entails appreciating how people learn to operate devices, how they use the communication and information options a given device offers, how their different purposes shape their choices of devices, interfaces, and modes (written, oral, or graphic representation), and how literacy figures into technology use.

This article explores the human side of the development-technology equation by analyzing what people do with their devices—mobiles, computers, printers, scanners—and how they use connectivity. We approach communication and information technology in the plural—technologies (ICTs) rather than in the singular, technology—to emphasize how actors connect various devices, social knowledge, literacy, and know-how through ICTs' use in specific activities. Furthermore, we extend the uses of digital ICTs to include design, as a

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way to identify how people use technologies to create or deliver services and as a way to expand our appreciation of why people do what they do (Geertz, 1983; Tacchi, 2005).

We examine how the owners of two informal microenterprises in Mexico City, operating in a context of urban poverty, incorporate ICTs into their work. We argue that using technology allows them to keep their businesses open in the face of harsh circumstances, and they do this with relatively little support. Some scholars (Chew, Llavarsan, & Levy, 2010; Horst & Miller, 2012) have noted that much research on this topic has been done in affluent contexts, what Barendregt called “the privileged centers, cutting-edge technology or the hip informational avant-garde” (2012, p. 206) and argues that our understanding of how these technologies are incorporated into the activities of daily life would benefit from studies into “diverse digital worlds.” Mexico is an example of such a place. While it has been described for the last 10 years as the seventh-largest economy among OECD members, it also has one of the largest income gaps in Latin America and the lowest gross domestic product per capita among member states. Of Mexico’s population, 43% live in poverty and struggle to make a living in difficult social and economic conditions (CONEVAL, 2017; OECD, 2017).

Microenterprises have traditionally been poor families’ response to adverse economic environments, as a way to survive hardship, be it chronic unemployment, unpredictable circumstances, economic exclusion, or natural disaster (Biles, 2009; Khavul, Bruton, & Wood, 2009). There has been a sustained interest in these informal organizations because of the role they are said to play in the socioeconomic development of poor countries (Dey, Newman, & Prendergast, 2011; Duncombe, 2006; Heeks, 1999; Makoza & Chigona, 2012; Qureshi, 2016).

For the most part, researchers have paid less attention to the incorporation of ICTs among the working poor in urban areas. Ravallion, Chen, and Sangraula (2007), cited by Clarke, Wylie, and Zomer (2013), argue that while the majority living in poverty in developing countries are concentrated in rural areas, “the magnitude of urban poverty is growing rapidly and the ‘poor are urbanizing at a greater rate than the population as a whole’” (p. 57). One notable exception is Chen (2016), who has studied the use of multiple technologies— analog and digital—among informal workers in Peru, India, and South Africa. She notes that “little is known about what technologies are used by the working poor in the informal economy, and in what ways” (p. 405).

Hernández (2015) studied how members of a marginalized community incorporated digital technologies into their daily activities. Using a New Literacy Studies (NLS) framework, a sociocultural approach for literacy research, he examined how people transformed reading and writing practices by using new technologies, different forms of representation, and connectivity. We take two cases from this study: First, Paola and her son, Yahel, own an embroidery shop, for which they purchased, integrated, and used a digital embroidery machine connected to a computer, a scanner, and the Internet. Second, we explore how Rosa operated a small cybercenter, rented out computer time, and developed a series of services and products for her clientele. We examine where their understanding came from, how they learned, and how they articulated literacy, social knowledge, and technologies in the process of developing their businesses (Blommaert & Jie, 2010).

Our article contributes to the technology and development literature in a variety of ways. First, while both the incorporation of technology and microenterprises have been essential components in strategies for development and poverty alleviation (Miller et al., 2005; Qureshi, 2016), this article looks at the intersection of the two (Carmody, 2014; Chen, 2016; Duncombe, 2006; Kamal & Qureshi, 2009). Furthermore, the effects of using ICT in businesses tend to be expressed in terms of how enterprises expand their operations, develop products, increase networks, and broaden markets (Carmody, 2014). We shift attention to how adopting technology helps microenterprises stay in business. Second, there is a clear call for nuanced and detailed studies on the processes and outcomes of technology adoption in impoverished contexts, not only wealthy ones (Castells & Galperin, 2011; Dey, Newman, & Prendergast 2011; Donner & Escobari, 2010; Horst & Miller, 2012). Third, the development literature tends to emphasize an individual device; our research looks at how people articulate several devices, software, and technologies (connectivity, computing, printing, and scanning) in work-related activities. Finally, we did our research within an NLS perspective, a theoretical perspective that underlines the situatedness of reading, writing, and meaning-making in the social world and has been extended to include digital technologies. NLS offers a methodology for observing ongoing situated events, constructing detailed descriptions of everyday use, and interpreting data. Through its qualitative lens, we pay attention to

what people do, say, and believe about how they use technology, literacy, and learning. One of the limits of our methodology, however, is that it is not easily replicable because any attempt to repeat this study will necessarily take place at a different time and with different people; even if it were carried out in the original context, these social actors, the historical moment, and the specific events cannot be reassembled. However, research such as ours produces hypotheses, documents patterns, and follows hunches that can be further pursued in other contexts (LeCompte & Schensul, 1999).

In the text that follows we present a brief account of the NLS stance that orients this study and we describe critical aspects of the research methodology. We then explore the development of microenterprises in the context of poverty; we end with a discussion and conclusions.

Some Key Aspects of New Literacy Studies

The basic tenets of NLS emphasize the contextualized nature of reading, writing, and other meaning-making practices. It questions the widespread notion that literacy is a neutral and decontextualized language technology that automatically leads to social, cognitive, or economic advancement. Instead, the NLS' notion of literacy posits that reading and writing are situated language practices that vary, depending on the context, purpose, and participants (Street, 1984). Because a premise of NLS states that literacy is a social practice, NLS underlines the importance of social relationships, material conditions, and institutional arrangements (Barton & Hamilton, 2000; Street, 1995). Lave (2011) notes:

Sociocultural theories posit that human activity is situated practice which assumes that “subjects, objects, lives, and worlds are made in their relations. That is, the contexts of people’s lives aren’t merely containers or backdrops . . . people are always located uniquely in space, and in their relations with other persons, things, practices, and institutional arrangements.” (p. 152)

This suggests that for the owners of microenterprises using technology in impoverished contexts, marginalization is not merely a stage where events occur. Rather, poverty contributes to how these businesses develop and owners take it into account when making decisions about how to run their firms.

Learning from a sociocultural perspective emphasizes the role of mediators (Vygotsky, 1980) and how people who, from a position of greater experience, demonstrate know-how to those who have similar interests (Gee, 2004; Lave & Wenger, 1991; Rogoff, 1990). Mediation can also take place between participants, where one is not necessarily more expert than the other; instead, those involved share knowledge and alternate taking the lead in different parts of a process. Discussing the appropriation of mobile phones in Bangladesh, Dey, Newman, and Prendergast (2011) explored how farmers experienced learning and how they might have been helped by others to use an application.

Finally, sociocultural theory places learning processes in the context of participation in collective activities, suggesting that knowledge is constructed through interaction with others in culturally and socially meaningful events (rather than acquired, transmitted, or internalized). Participants observe and interact in ongoing activities, regardless of their expertise; as they participate in shared events, they appropriate ways of doing, speaking, and thinking related to the activities (Wertsch, 1985). From this perspective, literacy refers to more than the rudimentary aspects of learning the alphabet or sounding out words. It refers to the development of language and communicative practices, a familiarity with social discourses, and the construction of the knowledge that contextualizes how reading and writing are accomplished in the social world. Learning to use a computer or a mobile phone includes appropriating what others say and do while they are using them, seeing how they operate their devices, and participating through trial and error.

In previous work Kalman (2005) distinguished access from availability, using the notion of availability to signal the material aspects of literacy (the physical presence of print materials, digital technologies, infrastructure for reading and writing such as post offices, libraries, bookstores, newsstands, cybercafés, etc.). Access, on the other hand, is useful for discussing the social conditions necessary for learning and use. She posits that access involves the opportunity to take part in meaningful and authentic events where reading and writing are essential for participation and for the opportunity to interact with other readers and writers.

Methodology

The cases in this article are part of Hernández's (2015) larger study focused on the use of digital technologies and new literacies in everyday situations (Lankshear & Knobel, 2011). These cases were selected because they illustrate the incorporation of digital technologies into work processes among the poor. To examine how participants accessed, integrated, and appropriated digital technology and literacy, we developed a research protocol from an ethnographic perspective (Green & Bloome, 2004). For three months, Hernández (2015) visited these shops and observed their use of digital technologies during everyday activities.

In the embroidery shop, information was collected through six semistructured interviews, and in the cybercenter information was obtained through three interviews. Study participants were sometimes invited to do "demonstrations" (Smith, 1981). We asked them to perform some of the tasks they talked about as a way to gain further understanding into how they accomplished work. We developed the demonstrations as a methodological resource for observing how informants performed daily jobs that involved the computer, the Internet, and other tools.

We collected data in the form of detailed notes that were recorded at the end of each observation period and, in some cases, through video and audio tapes. We transcribed recordings and searched for patterns in discourse and actions that provided insights into participants' knowledge and know-how of using digital artifacts (Blommaert & Jie, 2010; Coates, 1996; Gee, 2001; Gumperz, 1990). The data were triangulated by visiting other businesses in the area, contrasting the informants' views and reports with available information (for example, from the training videos the sewing machine company offered online) and comparing our observations with the informants' statements.

We describe how the owners of these microenterprises financed their investment, how they learned to use the acquired technologies, and the changes this brought to their businesses. We found that the introduction of technology into their shops involved changes in their family organization, priorities, and production processes.

An Abbreviated State of the Art: Development, Technologies, and Microenterprises

For the last 25 years or so, ICTs have spread, first as personal computers, then as laptops, tablets, phones, and smartphones. The Internet, once a tool of military, universities, and governments, became available to the public in the mid-1990s and has grown at unprecedented speed; today, nearly 4 billion people around the world are connected Internet users (We Are Social & HootSuite, 2017).

During the 1990s and the first years of this century, agencies such as the World Bank and the United Nations Development Programme increasingly emphasized ICT use in their programs as a strategy

for creating "Knowledge Societies" or "Information Societies" in which access to information resources through ICT services, electronic commerce, and electronic government combine to transform individuals' and communities' capacity for self-empowerment and economic growth. (Souter, Scott, Garforth, Rekha, & Mascarenhas, 2005, p. 26)

Communication technologies were viewed as a path for connecting remote rural areas with other regions and were referred to as "engines of development" (Rangaswamy, 2008).

Multiple studies have examined many uses of mobile phones and telecenters in poor communities and their impact on daily life (Duncomb & Heeks, 2005; Miller et al., 2005; Rangaswamy, 2008; Souter et al., 2005; Srinivasan & Burrell, 2015). Some documented examples of mobile phone use, particularly in rural areas of Africa and Asia, include family members using their cellphones to stay in touch, fishers and farmers finding market prices, and healthcare workers sharing information with community members. Telecenters have made ICT available to poor rural and urban communities where investment and infrastructure are needed. In a study reported in Zaremohzzabieh, Samah, Omar, Bolong, and Shaffril (2014), it was found that people in countries such as Colombia, Nigeria, and China used ICT to participate in distance education and training programs, interact with government online services, seek employment, and to a lesser extent, for their own business purposes such as to write letters, complete contracts, and create brochures.

DiMaggio and Hargittai (2001) raised concerns that the same social groups that had “greater access to education, income, and other resources that help people get ahead” (p. 1) would reap the benefits of digital technologies and the Internet, further exacerbating inequalities. The distinction between technological haves and have-nots became known as the digital divide and in its original conceptualization referred to those who had access to and had obtained technologies and those who did not, and to the differences in infrastructure, distribution, availability, and use of technologies between wealthy and poor nations. However, researchers contended that this dichotomy oversimplified the complexities of using technologies and argued for a more nuanced understanding.

Warschauer articulated his understanding of technology appropriation with the NLS framework by first analyzing the notion of access to technology and then turning his attention to literacy and social inclusion. In Warschauer’s examination of access, he states that its most common definition has to do with the “ownership of, or availability of, a device, in this case, a computer” (2002, p. 8). He argued that “social inclusion is a matter not only of an adequate share of resources but also of participation in the determination of both individual and collective life chances” (2002, p. 8). He pointed out the parallels between literacy and access to ICTs. First, in line with the tenets of NLS, Warschauer noted the complex character and plural makeup of literacy: There is not one type of reading and writing, their use and meaning are situated practices that vary across contexts. Likewise, the Internet can be used for information seeking, but also for online gaming, for direct communication, or for participating in *affinity spaces*, physical and virtual places where people meet to engage in shared interests (Gee, 2004). Second, Warschauer further argues that literacy is not a matter of absolutes, of being illiterate or literate; rather, it is an intricate articulation of discourses, conventions, and nuanced meaning-making, contextualized by social relations and institutional arrangements. Similarly, using ICTs implies operating devices and understanding how software works. It also is tied to users’ literacy practices, fluency, and other types of knowledge. He contended that neither literacy nor the use of ICTs has automatic benefits per se, they are construed in social, economic, and institutional events and relationships.

Avgerou (2010), Clarke, Wylie, and Zomer (2013), and Heeks (2010) also questioned the notion that ICT would necessarily lead to development. Chew, Llavarsan, and Levy (2010) remarked that although this idea had become widely accepted in public discourse, promoted by international organizations, governments, and news media, “robust evidence in support of that upbeat perspective still remains in short supply.” These researchers advocated for more cautious expectations.

One of the contexts of interest to development researchers is the microenterprise, which makes up 90% of businesses worldwide; approximately half of which are informal, unregistered organizations (OECD, 2004). Microenterprises provide cash flow and employment for poor families and have been a common solution to chronic unemployment and economic hardship in developing countries (Biles, 2009; Duncombe & Heeks, 2005; Qureshi, 2016; Sarkar, 2009). Duncombe argued that these small firms are important to development research because they provide “increased and more diversified income streams for poor households” (2006, p. 86). He also contends that they are of interest because they are a “viable route out of poverty” (p. 86), a notion contested by others (Carmody, 2014; Srinivasan & Burrell, 2015).

According to Kamal and Qureshi, “micro-enterprises are the predominant form of business in developing communities especially in areas where infrastructure and resources are limited” (2009, p. 4). For many of these enterprise owners, the immediate goal is day-to-day survival, rather than capital accumulation or growth (Carrillo, 2015, in Velázquez & Domínguez, 2015). For this reason, Aguilar, Mungaray, Ramírez-Urquidy, and Ramírez (2011) refer to these businesses as marginalized subsistence microenterprises. Approximately 94% of all firms in Mexico are of this sort (INEGI, 2015). The average monthly income from microenterprises in 2012 was about US\$370; 83% are part of the informal economy, unregistered and operating outside the tax system. In Mexico, 70% of these businesses fail within the first five years (INEGI, 2012, 2017).

Recently, several scholars have called for studies that examine the uses of ICTs in the context of microenterprises, specifically in poor communities (Anwar, 2015; Chen, 2016; Dey, Newman, & Prendergast, 2011). Makoza and Chigona (2012) argued that because most studies on the impact of ICT on livelihoods have focused on all businesses regardless of size, it is difficult to identify the evidence specifically pertaining to microenterprises. Several researchers provide some exceptions to the above. Srinivasan & Burrell (2015)

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detailed how fishers in Kerala used cellphones to monitor prices, making logistic arrangements for their products; Miller et al. (2005) described the ways phone use varied in Ghana, South Africa, Jamaica, and India. Chen (2016), Chew, Llavaran, and Levy (2010), and Miller et al. (2005) analyzed the presence of multiple technologies (including television and radio), but they looked at each technology independently within a given communication landscape. Several scholars have documented how businesses such as those that sell airtime, recharge batteries, offer messenger services, and sell and repair equipment have sprung up in poor communities as ICTs become widespread (Baro & Endouware, 2013; Carmody, 2014; Rangaswamy, 2008; Sarkar, 2009).

Literacies and Technologies in Two Family Microenterprises

Our description and analysis center on two microenterprises located in a poor neighborhood on the northern end of Mexico City. There are many informal microbusinesses located on its sloping streets, where the owners, their relatives, and their friends work in precarious conditions, lacking health benefits, vacations, job security, and the possibility of saving for retirement (Kroon & Pauwe, 2014).

In both cases, Paola (the owner of the embroidery shop) and Rosa (from the cybercenter) created their microenterprises, leaving low-paying jobs with poor working conditions and long commutes on precarious public transportation, often with safety issues. By comparison, going into business for themselves was worth the risk. Another bonus: Working at home allowed them to stay with their families. The knowledge gained at their former jobs was an important starting point for their businesses. However, this was not enough to keep their shops going; to stay in business, they had to develop new know-how, particularly in relation to using digital technologies. Both study participants had some formal schooling: Paola had finished the sixth grade, and Rosa attended school through the ninth grade.

Each description is organized around three notions: access, integration, and appropriation. The first—access—highlights the social and economic conditions under which participants incorporated digital devices into their business. The second—integration—explores how Paola and Rosa mobilized existing knowledge to integrate ICTs into work activities and the important role of mediators: local relatives, customers, and friends who helped them develop new understandings. The third—appropriation—looks at the ways the women used ICTs for their own purposes.

Digital Technologies in an Embroidery Shop

Paola set up her embroidery business in her home, where she lived with her two teenaged children. In the entrance was a counter, a mechanical embroidery machine, and a sewing machine. When she opened her shop, she worked exclusively on an electric machine, labeling and decorating caps, t-shirts, uniforms, and napkins. A few years after opening, she acquired a digital embroidery machine controlled by a computer. She also purchased a scanner and installed an Internet connection in an upstairs 12-square-meter room. A friend of her son assembled the computer from components and parts. Paola had three returning clients who brought her uniforms to embroider, the largest orders being for 30 articles. Other occasional clients ordered embroidered napkins, tablecloths, or specialty items.

Paola decided to open her embroidery shop after working in small and medium-sized companies for five years, where the pay was low and she had no benefits or job security. She used her understanding of how to produce embroideries and her skill at operating the mechanical machine to start her own shop. Her business supplemented the money her husband sent her from the United States, where he was an undocumented worker. Nevertheless, it eventually became clear that she needed to get a digital embroiderer because she was losing business to similar microenterprises in the neighborhood. In an interview, she narrated how her clients complained about the quality of her embroidery.¹

A long-time client told me [to] . . . make it look better. . . . [Another] person also told me very respectfully . . . "Fix this, it doesn't look right." And since it was with a lot of respect, that also helped me.

1. To facilitate reading, data are presented with standard punctuation marks, rather than sociolinguistic coding; (. . .) signals edited data and text in brackets [—] signals clarification by authors.

Purchasing the digital machine was a financial burden. Because the embroidery shop was informal, Paola did not qualify for small business assistance from the government. Financing this equipment came in part from what she had saved from her earnings, but mainly from the savings set aside from her husband's remittances. After saving for a year, she purchased the needed equipment.

Paola had never used a computer or smartphone. At the time of the purchase, her son Yahel was in his first year of study in a computer technician program at his high school. He dropped out to operate the machine in the family shop. In the beginning he simultaneously learned to use the machine as he filled orders, often depending on getting help to complete a job.

Yahel received a one-time visit from a manufacturer's representative, who explained how the machinery functioned during a one-hour talk. Yahel also attended five one-hour sessions at the supplier's locale in downtown Mexico City, a 90-minute trip on public transportation. The other person who helped Yahel with the machine was his cousin, who had several digital embroidery shops. He sold Yahel and Paola a copy of a design software package that was better than the one they had and showed Yahel how to use it.

Yahel described a time when he turned to his cousin to learn how to create an edging:

I went and I asked him . . . he said just use this tool, click here, and follow the edge of the cloth; when you go to *Properties* [on the software menu], put in 2.50 millimeters, and it will automatically stitch.

Yahel's cousin helped him solve many embroidery problems. He told Yahel what tools to use and how to use the software's menu. This allowed Yahel to automate how he finished the edges and embroider the words or phrases he designed. In this case, he did the design on the computer and then programmed the embroiderer to automatically replicate it.

This changed the way Paola and Yahel produced embroidered products in their shop. With the mechanical embroiderer, Paola individually reproduced each designed insignia or edging as she sewed them. In contrast, when embroidery was done on the digital machine, the creative work occurred when designing a figure on the computer. Sometimes Yahel traced a design made by a customer, a scanned drawing, or one downloaded from the Internet. Other times he designed a logo or insignia for his customer, selecting the font, the color of the letter, the orientation of the word or phrase, etc. Yahel learned to do this through practice, trying out different combinations of letters, sizes, colors, words, phrases, or drawings on the embroidery software. He referred to the design phase as *ponchado*, explaining it thus:

This program is for letters and images that are called *ponchado* . . . for example, you have a napkin to design for a *presentation*,² you choose your letter and write "my presentation," then hit Enter, you hit G on the embroiderer, and look for the letter. . . . you look for the letter, you choose the size in centimeters, and you place it [in this space] and here, it has a curve, you can drag [the design].

Yahel developed a system for saving his designs so he could easily retrieve and reuse them. He explained that he first saved them in a file as a finished product, one that was production-ready, and then as a file that could be modified. He said,

Here [pointing to screen] it says "My Presentation" and has the name "Angelica" and the date. . . . That file is saved as .mb, then filed as Tajima [.dst] and, if another order comes in, you can reuse it to make another design.

At local celebrations, such as baptisms or first communions, embroidered dinner napkins are commonly placed on tables and kept as party favors. Yahel explained that each time he created a design, he saved it with a file name that indicated the embroidered name and the date, saving them in two formats (.mb and .dst). This allowed him to quickly identify files to continue working on, to correct them in case of an error, or reuse them as the basis for a new design.

A typical napkin order would be 30–50 items, charging 19 pesos (approximately US\$1.52 in 2012) per napkin, including the cloth. If the client wanted a custom design, Yahel would add 50 pesos to the order.

2. A celebration when children three years old are presented to the community.

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He estimated that creating a design took approximately two hours. His hourly fee worked out to about 12.5 pesos (US\$1).³

Text-Based Services and Products in a Micro Cybercenter

Rosa was 32 years old when she left a receptionist job to help run the family cybercenter. Her sister Pilar had saved for over a year to open it. She equipped it with six computers, an Internet connection, tables, and chairs. A friend assembled the computers with an AMD processor, a 60GB hard drive, and other components and parts. She adapted a 20-square-meter area of her home to install her business. Over time Rosa and Pilar acquired two more computers, a scanner, and a small printer-photocopier. These purchases were made gradually from their personal incomes.

When they started their business, they rented computer time to customers for 10 pesos per hour. However, several similar enterprises soon opened nearby so Pilar lowered the price to 6 pesos per hour. To compete with the other businesses, Rosa and Pilar developed new services: recharging cellphones, paying bills online, looking up information, typing documents, downloading files, scanning, printing, and doing homework for a fee. They paid to obtain access to an online platform for paying bills and recharging cellphones, and the company gave them a printed manual and access to a hotline for help with questions. They also attended a one-time talk at the company, where a representative explained how the platform worked.

At her previous job Rosa had learned some of the basic uses of common computer programs. This knowledge allowed her to help clients at the cybercenter. Because of her schooling, she could do homework for students for a fee. For a six-page school report, Rosa would earn only 7 pesos. She charged 3 pesos for the first two pages of homework, and one peso every page thereafter. This required her to develop search strategies, research assigned topics, create acceptable reports, answer questionnaires, and so on.

Rosa said that her business had a good reputation among her clients because she produced “better quality” work than the other places. For example, new students came in because others spread the word about her service. She commented on what her student-customers said: “‘She can do assignments like information brochures, assignments like that, she can do them.’ For example, not anyone can put together a brochure, I can do it with Publisher, not everyone can do that.”

Rosa emphasized that she picked up new aspects of the software she used and learned to use new packages. She also learned to distinguish those webpages that contained reliable information from those that did not. For schoolwork, she learned to remove digital markings from the texts (such as electronic addresses and hyperlinked words), to find and insert illustrations, to unify formats, and to connect fragments taken from disparate sources, a task that included writing small transitions and lining up paragraphs, fonts, letter size, and margins. In short, Rosa learned some school literacy practices to produce the kind of reports that teachers in Mexico refer to as “doing research.”

Rosa appropriated some of the affordances of the Internet as part of the services she offered. One of these was locating addresses on a map and travel routes for getting to specific places. During an interview she demonstrated how to go to a community center on Google:

Rosa: For example, there is a [web]page for the Secretary of Communications and Transportation [that] makes a whole guide, draws a route, and [tells you] how much you might spend on gasoline, how many toll booths, and how much each booth costs.

Researcher: Do customers ask for this?

Rosa: No, but I tell them how [to get there]. . . . I find it for them. I say, “Tell me where you are going,” and then I tell them.

She knew that when her clients asked her about how to get to a place, she could use Google to produce a map and detailed directions. With these, she explained to her clients how to get there and printed the

3. At the beginning of data collection (2012), the rate of exchange was approximately 12.50 pesos to the U.S. dollar. Since then, the peso has been devalued and fluctuates constantly. Currently (January 2018), the rate of exchange is approximately 19.00. The 2012 value is to give readers a sense of shop owners' earnings.

information for them. She also knew that there were other options for finding maps, such as the one available on the Secretary of Communications and Transportation website. This page provides information about the route and toll prices and estimates the cost of gasoline for the trip.

Another way in which Rosa appropriated digital resources is illustrated by how she wrote budget proposals and filled out invoices for customers. In the following example, she described her customers' satisfaction with her work:

There is a gentleman who says, "I only come to you for this because you know how to fill out my invoices." [The customers] bring me their invoices, and I fill them out on the computer. They bring me the format, and I put them into Excel. I detect all the points where I have to fill them out, I put their invoice in and fill it out like it was a budget. Then [the customers] say, "I need you to do a *presupuesto* [bid, budget proposal]." The other day the gentleman went [to another cybercenter down the street], and they ruined three invoices, sometimes he waits for me, or my sister says, "He left this for you. Can you please do these for him."

In this case, she referred to filling out invoices and preparing budget proposals using Excel, software she learned to use at her receptionist job. She created an electronic format on the spreadsheet so she could fill it out and then print it onto the invoice. This enabled her to offer better service than the other cybercenters nearby. For this reason her client would wait for her to arrive or he would drop off work for her to do. Her appropriation of technological resources articulated her technical know-how with her knowledge about writing invoices and her understanding of the elements required in a budget proposal.

Discussion

In both cases, Rosa and Yahel used their knowledge and technological dexterity to develop products and services. Learning to operate devices was coupled with help from others, using software for authentic purposes and participating in situated events. Knowing about the social world—be it neighborhood festivities or doing paperwork for official procedures—is important to understand how the two study participants used literacy and technological devices. For both of them, their immediate networks—turning to family and friends to learn to use the hardware and software to enhance their products and their business possibilities—were key to their business survival.

Rosa and Yahel had ninth-grade educations, and their formal schooling was an important asset for their businesses. The ways Yahel and Rosa used reading and writing go far beyond the rudimentary aspects of literacy such as drawing letters (or in this case using a keyboard and mouse), reciting the alphabet, or sounding out words (Rangaswamy, 2008; Sarkar, 2009). They read manuals, were familiar with various discourses and genres, and were aware of how topics and files were classified, stored, and searched.

When compared to education levels in much of the developing world, it may seem as if they had extensive schooling, but Yahel and Rosa are below the average for Mexico City (11.1 years) (Secretaría de Economía, 2016). They used reading and writing for specific purposes (for example, doing online searches or creating images and filing systems) and learned to use both literacy and technologies on a need-to-know basis, in the context of performing work. The role of other people was key—both mentors and customers—for expanding their grasp of their devices, software, and written language and for enhancing their operations.

Both the embroidery jobs and the cybercenter services required the use of multiple digital devices and artifacts. Yahel worked with hand drawings, images found on the Internet, drawing software displayed on his screen, and the embroiderer. Rosa scanned documents, completed forms, and used the computer, Internet, and printer to produce a school report or online pages for invoices or maps.

These examples show the complex ways they tried to meet their customers' demands and how they developed their businesses accordingly. In both cases, it involved exploring and experimenting with the technologies and learning new ways of doing. Neither of these shops had "training programs," so Yahel and Rosa adapted to situations as they arose. An important aspect for scholars carrying out qualitative studies on technology appropriation in contexts of poverty is to look for social support networks as a way to understand how technology is embedded in the fabric of community life and inserted into personal experiences.

Conclusions

In this article, we looked at how the owners of two microenterprises operating in Mexico City first incorporated ICTs into their business and then expanded their use. We examined aspects of the knowledge the study participants mobilized to use technologies, how Yahel and Rosa extended their understanding of both literacy and technology and how they articulated that know-how and social knowledge and those technologies.

Our analysis shows the intricacies of how ICTs are embedded in complex activities; identifying and understanding Yahel, Paola, and Rosa's social networks of family, friends, and customers are key to grasping how they incorporated technology into their businesses and, thus, into their communities and individual lives. Even though they did not apparently expand their enterprises, the owners developed their firms from within, improving production processes and creating a stream of products and services. While these activities did not diversify their markets or radically increase their income, these activities allowed them to survive, to stay in business by keeping their customers and gaining a few more.

Duncombe portrayed subsistence microbusinesses as provisional and unstable, describing poor families as likely to "step in and out of micro-enterprise activity depending upon the nature of the activity, seasonal demand, the availability of resources, and other personal and social factors" (2006, p. 82). This is not the case in our study; both microenterprises had been the families' source of income for several years. During the study period, the embroidery shop had been open 10 years and the cybercenter for four years. For these families, their businesses were the way they made their living and they did not appear to have better options. Yahel left school and Rosa and Paola left low-paying jobs to run these businesses.

While the introduction of ICTs into larger businesses is said to increase markets, improve attainability of more and better information, connect sectors and industries, and bolster networks, several researchers have noted that microbusinesses in poor communities often do not obtain these same benefits (Dey, Newman & Prendergast, 2011; Duncombe, 2006; Quereshi, 2016). Carmody (2014) has described the effects of technologies on businesses regarding *transformative adoptions* (ICTs bringing about important changes in how business is done) and *reproductive adoptions* (using ICTs in existing procedures without causing changes). Rather than seeing these adoptions as a dichotomy, we see them as the two ends of a continuum. Both microenterprises studied here incorporated ICTs, and they seem to fall somewhere between transformation and reproduction: In the cybercenter, technology was key to establishing the business. In the embroidery shop, Paola introduced technology as a way to improve her products. Both microenterprises created products and transformed production processes, with no observable change in growth in terms of the number of employees, customers served, or income despite their efforts to improve their businesses. A limitation of this article is that while we gained understanding in these specific contexts, we report on only two shops. Qualitative approaches such as NLS are appropriate for creating and interpreting close-up portraits of social life; the study of other shops would allow us to further understand the diverse effects ICTs can have on micro-organizations and identify the ways owners and workers take up and use technology.

The foregoing discussion compels us to look critically at the role of social conditions. Srinivasan and Burrell (2015) and others have pointed out how diverse factors intervene in the ways technology use leads to improved livelihoods, including the existence of social networks, mobility, and availability of financing, among others. We contend that the inverse is also essential to explore: the factors that intervene when a business does not expand even though it has introduced new technologies, procedures, and products (Carmody, 2014).

Although it is improbable that technology will provide a way out of poverty, it potentially has a role to play in some families' efforts to make ends meet. This article illustrates the importance of local mentors for constructing digital know-how and literacy in a community. While technologies are not a panacea, they are a social good with multiple affordances and uses. Fostering local mediators is one way to boost its dissemination and appropriation. As community members become more fluent in its use, they also become potential resources for other people. This in itself makes a case for imagining new policies that contribute to creating the social conditions necessary for accessing digital technologies and reading and writing practices.

In the cases reported here, one aspect that stands out is the relative isolation of the study participants. Their daily activities seldom went beyond their immediate neighborhoods except for an occasional trip downtown

for appointments or supplies. Their ideas for attracting more customers or promoting new products resided within the confines of their communities. They are, in this sense, limited to the local (Brandt & Clinton, 2002), and this may partly explain why the participants' businesses did not expand. Despite having Internet connections and access to several messaging options, participants did not use them often and they generally communicated only with people they knew (Miller et al., 2005). While they hoped for new clients locally, the idea of expanding their market geographically was not something they mentioned. This calls into question the globalizing potential of ICTs per se and puts how they are used and how they figure into existing worlds, social relations, and communication practices in the spotlight.

In the embroidery shop, Paola and Yahel introduced a digital machine to an already-working enterprise as a way to save the business by transforming the way they produced embroideries and by keeping up with local competitors. The cybercenter, however, was established to provide computer- and Internet-related services, so the ICTs were part of the original plan. Neither case shared the conditions of larger affluent businesses with international markets, financial resources, or government support. Our cases are examples of what Barendregt calls the "awkwardly connected" (2012, p. 206), using makeshift computers, working in constricted spaces, with restricted access to know-how and without financial resources.

The above makes it easy to overlook and underestimate the importance of the multiple efforts that Paola, Yahel, and Rosa made to keep their businesses afloat. As a consequence of their actions, their businesses evolved and Yahel and Rosa became more knowledgeable and competent in using ICTs and multiple literacies, and in how they did their jobs. Authentic work processes, mediators, and relating to customers provided contexts for developing new ways to use software as well as reading and writing. They reorganized how they worked, diversified their products and services, and the changes they made required time, hard work, and determination. These efforts enabled them to stay in business. The making of their survival was the result of perseverance and resolve; many such enterprises fail. Subsistence here is an accomplishment and a success story. ■

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