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Abstract

Most challenges in ICT for development (ICT4D) projects can be related to differences in perceptions of systems developers and their actual users. Such design-actuality gaps exist both because designers take an uninformed stance towards the user context, and also because problems that ICT4D projects address are nested in systems whose interplay is nearly impossible to predict. Although gaps are inevitable, users are not passive recipients whose only choices are to accept shortfalls in design or reject ICT4D technologies. Rather, users may act to remedy shortfalls through system work-arounds. In this paper we investigate the design use gap in the Brazilian correspondent banking model, an ICT4D project in which local small businesspeople interact with social, financial, government, and technical systems to provide financial services mostly for poor populations. Our findings suggest that correspondents' acts to alter the financial and social systems proved sufficient to permit success of the project. Our results point to the importance of taking into account user actions and the separate roles of individual systems when designing ICT4D projects and theorizing their performance.

Keywords

ICT4D, Design-actuality gap, Correspondent banking, Financial inclusion, and Social systems.

1. Introduction

Over the last two decades, ICT use has risen sharply in developing countries as governments improved public services, MNCs and other private companies implemented systems to support operations, and international agencies introduced ICTs to spawn economic development (Avgerou, 2003; Walsham, 2010). In response, research has focused on challenges in the design and implementation of ICTs in these domains. Moving from

challenges to models of project performance continues to elude researchers, in part because a preponderance of descriptive rather than analytical research has favored actionable results over the creation of knowledge (Heeks, 2006). Studies have been successful, however, in identifying key misconceptions about the role of ICTs in promoting social and economic development, with findings that are particularly relevant to project performance in the realm of government and development agencies.

Two core misconceptions are that ICTs are sufficient stand-alone solutions for complex social problems (Warschauer & Ames, 2010) and that transfers of ICTs between developed and developing countries account for technical literacies of users while underestimating cultural, political, educational, and infrastructural realities (Avgerou, 2008). Designers too often consider users in developing countries "merely passive recipients of the benefits of technology" (Andrade and Urquhart, 2012:281). Heeks (2002) proposed the idea of a "design-actuality gap" to describe situations in which designers' narrow conception of the problem was inaccurate. Warschauer and Ames (2010) provide evidence of this gap in describing how project sponsors conceived an ICT initiative as a simple solution to an economic development problem, which proved to be contrary to the views of local users, who thought the inconsistent use of ICTs across social strata amplified pre-existing socioeconomic differences. In general, misconceptions that emphasize technology and economic development may overlook the diversity of challenges associated with ICT for development (ICT4D) projects, thereby cloaking factors that prompt project success or failure (Kleine, 2010).

Although scholars recognize that they must expand the research lens to understand ITC4D project performance, the ICT4D literature has neither teased apart the role of various non-technical systems (e.g., social, governmental, institutional) in shaping the context of ICT4D projects nor investigated how users – who ultimately must confront the difficulties posed by design-actuality gaps – alter their behavior or modify systems to compensate for design deficiencies. We explore these issues in this paper through an investigation of Brazilian correspondent banking, an ICT4D project in which local small businesspeople interact with social, financial, government, and technical systems to provide financial services for underserved populations.

In their review of the ICT4D literature, Walsham and Sahay (2006) noted a paucity of theory and pointed to Heeks' (2002) design-actuality gap as a possible building block. Following that lead, our contribution is, first, to show that design-actuality gaps exist not simply because designers take an uninformed stance towards the user context, but because the problems that ICT4D projects address are nested in systems whose interplay is nearly impossible to predict at the outset. In short, gaps are inevitable. Second, we show that although gaps are inevitable, users are not passive recipients whose only choices are to accept shortfalls in design or reject ICT4D technologies. Rather, users may act to remedy shortfalls through system work-arounds. By extending the research lens to user actions in the face of design-actuality gaps, we expand the realm of factors to consider when modeling ICT4D performance and suggest that success is not reliant on gap-free designs. To set the stage for our inquiry, we briefly review research that pays attention to the design-actuality gap.

2. The Design-Actuality Gap in ICT4D Projects
When the United Nations set its Millennium Development Goals in 2000, many international development agencies responded by devoting resources to the deployment of technologies in developing countries, spawning the ICT4D movement. Wilson (2002: 12), who analyzed 101

documents from 7 international development agencies (World Bank, Unesco, UNDP, IDRC, ITU, GKPF and USAID), found that each agency considered ICTs a "magic development solution" to the problem of poverty. When these ICT4D projects began to fail, scholars put forward a variety of reasons to explain poor performance.

In some cases, scholars found fault with Western developers' ignorance of local contexts in developing countries. As Suchman (2002: 143) noted, "Technologies designed at a distance generally are characterized by a design/use gap that requires either substantial reworking of the technology or, if that is impossible and prospective users are powerful enough, its rejection." Along these lines, Cervantes et al. (2011:945), highlighted that implementing school laptop use in developing countries "is far more complex than what technology designers assume." In other instances, scholars placed part of the blame on users. For example, in addition to finding problems in usability and support in ICT4D projects, Medhi et. al. (2010) also identified users' ICT illiteracy and unease with technology as causes of project failure. Still other scholars blamed development agencies' top-down approach for not supporting the activities of users (Thompson & Walsham, 2010). In almost every case, scholars noted a difference between users' reality and designers' conceptions.

Heeks (2002) termed this difference the "design-actuality gap" (later, the "design-reality gap," see Heeks, 2003). Scholars typically argue that designers can avoid this gap by taking a holistic approach to ICT4D projects. For example, Toyama (2010) as well as Silva and Hirschheim (2007) noted that most challenges in ICT4D projects are extra-technological, and that designers must consider political, social, cultural, economic, and other factors. Similarly, Puri (2007) identified four knowledge domains relevant to ICT4D projects – technology, application, community, and implementation – that designers needed to consider when creating ICT4D solutions. Notably, almost all scholars focus on correcting the gap at the point of design, not use, presumably on the grounds that users are either too politically weak or technologically illiterate to modify ICT4D solutions to remedy the problems that gaps occasion. Heeks (2002) is one of the few scholars to note that users might narrow design-actuality gaps through improvisational acts. Research has yet to examine when and how these improvisational acts might occur. We explore this possibility and build on the idea of different knowledge domains, which in the case of Brazilian correspondent banking we construe in terms of different systems (i.e., social, financial, governmental, technical), as we examine how design-actuality gaps occur and how users deal with them.

3. Methods

We chose Brazil's correspondent banking model as the setting for our inquiry. Faced with new government laws mandating financial services to underserved populations, many of which were poor or remote, Brazil's Central Bank set the regulation for the correspondent banking model to allow non-financial institutions such as grocery stores, post offices, and lottery shops to provide a range of financial services on behalf of traditional banks (Alves & Soares, 2006). Although this regulatory change allowed banks to offer a variety of financial services through correspondents, banks have come to restrict most correspondents to transactions related to government benefits delivery and bill payment collection (BCB 2011:39).

The technical system at the heart of this model consists of a rudimentary, easy-to-install package featuring a point-of- service machine or a personal computer as terminal, with limited accessory equipment such as barcode scanners and keypads. These terminals connect

to bank servers directly via Internet, General Packet Radio Service, or even satellite. Many banks work with intermediary partners, called network integrators, who install this equipment for correspondents, and in some cases hire and train correspondents (Jayo et al., 2012).

The Brazilian correspondent banking model is an intriguing ICT4D case for at least three reasons. First, a developing country plays the role of designer (see Khalil & Kenny, 2008). Heeks (2008:32) suggested that when developing countries are the designers, chances are greater for "designs around the poor's specific resources, capacities, and demands." Second, the correspondent banking model is simultaneously an intrinsic and instrumental case (Stake, 1995). It is an intrinsic case because it is the largest branchless banking infrastructure in the world, serving as many as 80 million people through 150,000 outlets (BCB 2011). It is an instrumental case because many other countries use similar models of branchless banking. According to a World Bank research center dedicated to financial access for the poor, "What happens next in Brazil when it comes to correspondent banking will serve as a considerable source of learning for the rest of the world" (CGAP, 2010:4). Finally, because this case involves a government program designed to address a social problem via financial institutions operating with ICTs, it allows us to tease apart the role of each system in contributing to the design-actuality gap.

3.1. Research Design

To understand the interplay of the social, financial, technical, and governmental systems in the correspondent banking model, we interviewed 51 individuals across a variety of roles. Specifically, we interviewed 21 correspondents (owners or clerks in lottery shops, grocery stores, drugstores, Internet shops, and post offices); 15 *bancarios*[1] (tellers or other agents in traditional banks); 12 bank managers (branch managers, mid-level managers, and senior level managers); 2 network integrators (third parties who handled equipment installation and support); and one of the main designers of the model (a bank director at the time of design).

To ensure that our findings were not particular to any given bank, we spread our interviews across three banks that together account for more than 70% of the correspondents offering transactional services[2]. Two were public banks (Banco do Brasil and Caixa Econômica Federal) and one was private (Bradesco). We also chose two very different geographical locations in Brazil – the states of Sao Paulo and Pernambuco – to guard against results based on regional differences. In Sao Paulo, we interviewed bank executives in well-heeled neighborhoods; network integrators in corporate office parks; bank managers, *bancarios*, and correspondents in *favelas* (slums); and bank personnel in branches on the outskirts of the metropolitan area of the capital. In Pernambuco, we interviewed bank managers, *bancarios*, and correspondents in a city of 35,000 inhabitants 400 km from the state capital; we also interviewed correspondents in 5 nearby towns ranging from 5,000 to 10,000 inhabitants, in some cases accessible only by dirt road, where correspondents provided the only financial services. Working in air-conditioned offices, network integrators, bank managers, and *bancarios* wore professional attire and took breaks from work for our interviews; correspondents typically dressed casually and often talked to us while serving customers in their small shops.

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[1] In Brazil, *bancario* refers to any employee of the bank from teller to bank president. For clarity, we reserve the term for non-managerial workers.

[2] According to data from the Central Bank available at www.bcb.gov.br/?CORPAIS.

3.2. Data Collection

We conducted our interviews in teams consisting of one American and one Brazilian. Interviews followed a protocol, with flexibility for probing questions. The American team member asked questions in English, which the Brazilian researcher translated to Portuguese; almost all informants answered in Portuguese, which the Brazilian team member then translated to English. We audio recorded and transcribed interviews. In addition to interviews, we wrote detailed field notes to capture details of the physical environment, clientele, and the like.

3.3. Data Analysis

We begin our analysis with repeated readings of our interview data and fieldnotes as we searched for emergent themes, which we discussed in our research team to assess initially their resonance across different banks, geographic locations, and bank roles. One theme that struck us as a "core category" (Corbin & Strauss, 2008:104) was the apparent mismatch between how bank managers, *bancarios*, and network integrators viewed the correspondent banking model and how correspondents viewed it. To confirm this sense that arose from our reading and discussion, we generated codes from the literature, in this case building from Heeks' (2002) idea of a design-actuality gap and Puri's (2007) notion of knowledge domains. Using the resulting codes, we employed a constant comparison method (Corbin & Strauss, 2008) to probe our data for conceptions and reality across four systems central to the correspondent banking model (social, financial, government, and technical), refining our codes as we went along to better fit our data. We also coded for actions that correspondents took to address the design-actuality gap. This approach enabled us to tease apart the role of each system in shaping conception and reality.

4. Findings

Our interviews revealed that designers and implementers in this case envisioned a simple technical solution for a simple social problem: By government decree, families all over Brazil were to receive their government benefits checks locally. But the banks charged with distributing these checks determined that opening branches in many remote areas of the country would be too costly. Instead, the banks authorized select grocery store owners and small businesspeople as "correspondents" who would be trained quickly. The correspondents would handle simple transactions, including the distribution of government checks and the collection of bill payments. Although the technical solution indeed proved simple – often arriving in a small kit and requiring little more than plugging into an electrical outlet for installation – the social problem required more than a transactional exchange would allow. To accommodate the rural public's limited technical and financial literacy, correspondents filled the "design-actuality gap" by building personal, flexible social and financial relationships with clients that facilitated effective system workarounds.

4.1. A Simple Problem, with a Simple Solution

A key designer of Brazil's correspondent model was Henrique Costabile, at that time a director with the government bank, Caixa Econômica Federal. Trained as an engineer, Henrique viewed the problem of distributing government benefit checks in terms of the logistics of cash flow:

> *There was a law saying that Caixa should pay everybody in the country that has this profile [to receive government benefits]. So that was the problem:*

how can we pay benefit for studying in the middle of the Amazon, if there is no branch there? Then we came up with the correspondent banking solution.

The solution was simple. Because most towns had—at bare minimum—a drugstore, bakery, or grocery store, the store's infrastructure could be used to make bank transactions. In the case of a student in the middle of the Amazon, Henrique explained, "When he passes the card, what happens is we debit the funds for that benefit, and we credit the account of the bakery, and the bakery gives the money, physically, back to him. That is the transaction."

The correspondent model addressed the social problem incurred when people traveled long distances from their remote town to a city bank while simultaneously spurring local spending and development in ways that bank managers did not foresee. As Henrique explained,

> *If you take a city like, for instance, close to Santarem in the middle of the Amazon, a person that was going to receive his pension funds, he would take a boat, ride this boat up to the river for seven days, go to a bigger city, where there is a bank to receive his money, and he wouldn't go back to his city with the money. He would spend all the money in the big city and go back with the goods, in the same boat another seven days. So every month this person was killing 15 days of his life just to get the money and come back, and his village, there wasn't economic development there because there is no money…Now, he won't have to go up the river for seven days, he is still in his village, will receive the money in the drugstore, and will spend the money there.*

The correspondent solved another social and financial problem for bankers. Previously, rural travelers with their low-margin transactions formed long lines in city bank branches. Bank customers with high-margin transactions faced long waits as a result. The correspondent model moved the low-margin customers into local stores. Silvana, a Caixa lottery shop correspondent, explained that "[the branch] is for the elite and I'm for the simple, rural public…" Paula, a Banco do Brasil bancario, similarly remarked,

> *A lot of people don't have bank account, don't have access to bank, don't have proven income… this public doesn't interest me; I am interested in people that want to do business… the banking correspondent takes out this load of people, leaving my branch wonderfully beautiful…[before,] thousands of non-clients, pedestrians would come, fight, speak loudly, and provoke discussions. These people don't need to come here anymore; they can go by their lottery shop, grocery store, what have you and pay their bills.*

The bank managers reiterated the simplicity of the financial and technical systems that governed the correspondents' activities. Correspondents confirmed that the technical system was easy to install and operate. Because correspondents handled simple transactions with limited equipment, their training was intentionally slim, as this exchange illustrates:

Interviewer:	*So, the training on the equipment, how long is it? One day, two days, a week?*
Network Integrator:	*About two hours, max…I send a kit to the site…As soon as the kit gets there, I take the initiative to call the person to ask, "Is the kit there with you? Do you have time available to turn it on, for us to test?"*

| Interviewer: | *Oh, because it is the person himself who installs?* |
| Network Integrator: | *Yes, it is just to plug the cord in the wall.* |

4.2. A Design-Actuality Gap Prompts Problems

Although designers and implementers thought they had a simple technical solution for a simple social, government, and financial problem, reality was a bit more complex. Three factors contributed to the design-actuality gap in the correspondent model.

The first difference between design and actuality was that correspondents and clients viewed correspondents as synonymous with *bancarios*. Correspondents minimized their task differences with bankers. Marcio, a Caixa drugstore correspondent, noted over a dozen services that he could offer clients, pointing out only one that he could not perform that *bancarios* could: opening saving accounts. Clients who viewed correspondents as *bancarios* were frustrated when correspondents could not meet all their financial service demands. Moreover, clients expected correspondents to resolve government problems such as stopped benefits, reduced benefits, and threats to turn off utilities even though the correspondents' simple interfaces offered no linkages to agency databases with client information. In this way, the correspondent banking model set up client expectations with respect to the governmental and financial systems that correspondents could not meet.

A second issue arose in conjunction with the interaction of the technical and social systems. Although the equipment was simple to operate, it was not always reliable, with connections to the bank's servers routinely going down. Marcio, a Caixa drugstore correspondent, confessed,

> *The most difficult part is when the client gets here upset, aggravated, or furious with some personal problem and wanting something that at that moment we can't offer. For example, sometimes, a client wants to pay its bill or cash some money and the system is down, and I can't help, it's a technical issue with the bank.*

In addition, the technology, in its simplicity, required client documents to be equally uncomplicated: any little variation in the document, such as a crease in a bill stub, could render the system unable to process the transaction. The poor people who were the correspondents' clientele were often unable to maintain their documents in conditions sufficiently pristine for the technical system.

A third factor contributing to the design-actuality gap arose from the financial system in the form of additional limitations set in place by the banks to limit their liability with respect to cash. These limits included caps on how much money a client could withdraw and how much total cash a correspondent could receive. For instance, Marcio, a Caixa drugstore correspondent, recounted, "The other day a guy walks in trying to cash R$1,500 and I had to explain that the limit here is R$1,000 and we are not the bank." The banks also limited correspondents' ability to make changes in accounts or rectify transactions after the fact.

Thus, although designers provided a simple technical solution for serving poor and remote communities with essential banking services, there were more complicated social, government, and financial factors associated with the correspondent banking model. To remedy the design-actuality gap prompted by these factors, correspondents took to expanding their role.

4.3. Role Expansion as a Solution to the Design-Actuality Gap

Correspondents attempted to fill the design-actuality gap with small improvisational acts aimed at altering the two systems malleable to them: the social and financial systems.

Correspondents altered the presumed social system by talking personally to clients, taking time to explain issues, getting to know their families and situations, directing them to appropriate services to resolve issues, and even helping them with personal problems not related to government benefits or bill payments. To handle clients who lacked both technical acumen and financial knowledge, and who routinely had problems in their benefits or bills, the correspondents needed to be more than mere processors of transactions as the originators of the correspondent model had in mind. Instead, in a personal manner, they needed to help people solve their personal problems. Silvana, a Caixa lottery shop correspondent, explained, "We're the 'human ATM.' Caixa's ATMs are there, but they don't talk to the client, and here we do, we give them security and support." When correspondents equated themselves to "human ATMs," they reflected how they filled the design-actuality gap through extra-role behaviors.

For example, clients expected the correspondents to resolve for them problems that they had with the bank, government, or utility services. Correspondents tried to determine where clients should go to resolve these problems because they felt a deep empathy for their clients, a sentiment that was much less prominent among the *bancarios* who we interviewed. Marcio, a Caixa drugstore correspondent described how he helped uninformed or misled clients:

> *I explain what was done wrong and show how to do it right. There are people*
> *that don't know the difference between R$5 or R$50. You can charge them*
> *R$50 instead of R$5 and they will thank you for doing so.*

In this manner, correspondents' roles expanded as they guided clients through the social system. Many correspondents described themselves as "public servants" because they were helping "people that are so simple, that haven't ever gone to a bank, or are shy to go there…sometimes they think that going to a bank…is really hard, which it isn't, but a humble person thinks that is, and they are more comfortable coming here" (Neusa, private bank correspondent).

Correspondents similarly manipulated the financial system to overcome the design-actuality gap. For example, the 10-key pads for entering passwords proved overwhelming to many clients. Although the pads were meant to be displayed facing the clients, who would enter their passwords while standing across from the correspondent, the pad was most often positioned beside and facing the correspondent. Post office correspondent Maria explained, "On a regular basis is like this, an elderly comes and gives us their card and password. They trust us, and they don't check the money, and we need to do this for them." Network integrators who we interviewed, and who had not visited the field, were astounded to learn from us that clients shunned such a simple interface.

Correspondents also developed workarounds to financial system restraints enacted by banks. For example, correspondents "borrowed" money from their business to cover gaps in the correspondent revenue so that they could process transactions for clients. As a Caixa grocery store correspondent, Luciene "took money from the market to take care of the customer, because if every now and then, someone comes and [the machine] is out of money, what will

happen?" In sum, these findings show that correspondents were able to fill the design-actuality gap by engaging in extra-role behaviors and system work-arounds.

5. Discussion

The Brazilian correspondent banking system was not free of a design-actuality gap. Rather, our analysis revealed that all four of the systems – social, governmental, financial, and technical – involved in the Brazilian correspondent banking model contributed to the design-actuality gap, but in different ways and to different extents. This finding lends support to scholars' contentions that designers would do well to consider extra-technological factors when contemplating ICT4D projects (Puri, 2007; Silva and Hirschheim, 2007; Toyama, 2010).

Despite having a design-actuality gap, the correspondent banking model nonetheless worked. Why? The model worked because, as Heeks (2002) suggested, correspondents carried out improvisational acts to narrow the design-actuality gap. Correspondents' acts rendered them "human ATMs" who helped unsophisticated clients navigate social, government, financial, and technical systems. Correspondents' actions further involved working around financial system restrictions to enable client service.

Notably, only the financial and the social systems were malleable enough for correspondents' actions to bridge the design-actuality gap. The government and technical systems, by contrast, lay beyond the correspondents' grasp and thus were never a target for correspondents' actions. The government system of welfare benefits that created the motivation for the correspondent model was beyond the grasp of correspondents because it operated at the federal level in a centralized and bureaucratic manner. Correspondents neither had access to government records or databases nor authorization to act on the behalf of government agencies. Thus, for example, when a client's benefit changed or his payment was blocked for some reason, there was nothing a correspondent could do except to tell the client to report the problem to the relevant government agency. Puri (2007:358) classified this knowledge domain as implementation-specific, "built upon bureaucratic rules, guidelines, and norms prescribed by government agencies;" in our case, designers did not incorporate fully this domain of knowledge into the correspondent banking model and, as a result, correspondents had no ability to modify the government system. Likewise, the technical system, whose associated knowledge domain is "explicit, considered universally applicable, rational, analytical objective, codifiable, and hence transferable" (Puri, 2007:358), was, in the case of the correspondent banking model, also hardwired and strictly designed for delivering transactions. Correspondents did not know how to write computer code to modify the technical system and they lacked the technical expertise to otherwise bypass the highly structured menu interface. For this reason, correspondents could not carry out small improvisational acts to alter the technical system to bridge the design-actuality gap, something that might be possible in other ICT4D projects and certainly in many Western ones.

Our findings suggest that, although multiple systems may co-construct design-actuality gaps, not all systems need be involved in bridging these gaps. Here, correspondents' acts to alter the financial and social systems proved sufficient to permit success of the project. Our results point to the importance of taking into account user actions and the separate roles of individual systems when designing ICT4D projects and theorizing their performance.

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