Challenges in Computerized Job Search for the Developing World

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Abstract

We examine the broad challenges facing a computer-based system to help match low-income domestic workers from an urban slum with potential middle-class employers in Bangalore, India. Due to the near impossibility of implementing such a system in one shot, we first implemented a paper-based system that provides the intended functionality but without a computer. This system proved a significant challenge in itself, and among the lessons learned are the crucial role of human intermediaries (necessary even in the final computer-based system), the importance of building skills among the domestic workers, the need for a strong value proposition for both employers and employees well above existing systems, and the requirement of technological literacy. We then show that these lessons are applicable to other scenarios where computing technology is applied to developing-world challenges, by analyzing corresponding issues in related work.

Our broad conclusion is that computer-based systems to solve developing-world problems often require significant work above and beyond an implementation of the technology, with trustworthy human intermediaries playing a critical role.

Keywords
Developing world, paper-based system, domestic laborers, NGO

Introduction

"Information and communication technology for development" (often abbreviated ICT4D) is an emerging field in which computing and electronic communication technologies are applied to the goal of achieving socio-economic growth for poor communities around the world [2]. ICT4D is as much a slogan as a field of work, and like many slogans, it emphasizes idealistic goals over the costs, benefits, and significant challenges, of meeting the goals.

In this paper, we examine the challenges of implementing a particular ICT4D project, in which the goal is to use a computer-based system to help match low-income domestic workers from an urban slum with potential middle-class employers, in Bangalore, India. In previous work, we described user-interface principles that allowed domestic workers (who were largely non-literate and had little formal education) to use a PC [5, 6]. Here, however, we take a step back and consider the broader – and frequently underappreciated – hurdles facing those who seek to apply computing technology in developing-country environments. To our knowledge, the project described in this paper is novel in its own right, but our primary intent is to focus less on the system itself, but rather on what we believe to be generalizable lessons we learned when implementing a paper-based pilot as a prelude to a computer-enabled system.

Connecting Employer and Employee

The domestic workers in question are those who cook food, wash dishes, mop floors, and clean toilets in other people's homes. In cities everywhere, but particularly in developing countries, employment of domestic workers is informal and outside the purview of government regulation. In Bangalore, for example, where there is an estimated market of 400,000 domestic workers across the city [7], there is no certification for workers, no employment office, and certainly no minimum-wage law. The police maintain a registry of workers, but sign up is voluntary and almost no one registers, likely due to concerns that they will then be taxed on the very little they do earn: Incomes are in the range of US$30-60 per month, and there is an endless supply of labor from nearby villages happy to undercut the city-dweller.

Today, such workers find employment entirely through word of mouth, with almost no formal or organized means of identifying potential employers. Employers similarly have no access to a reliable source for employees, and so requests for workers flow through friends, family, employees and *their* families, apartment-complex security guards, and anyone else who might serve as a bridge between employer and employed. An occasional neighborhood busybody might take it upon themselves to act as a broker for a small fee, but this, too, is informal. **Figure 1 (A)** shows the current situation in schematic form.
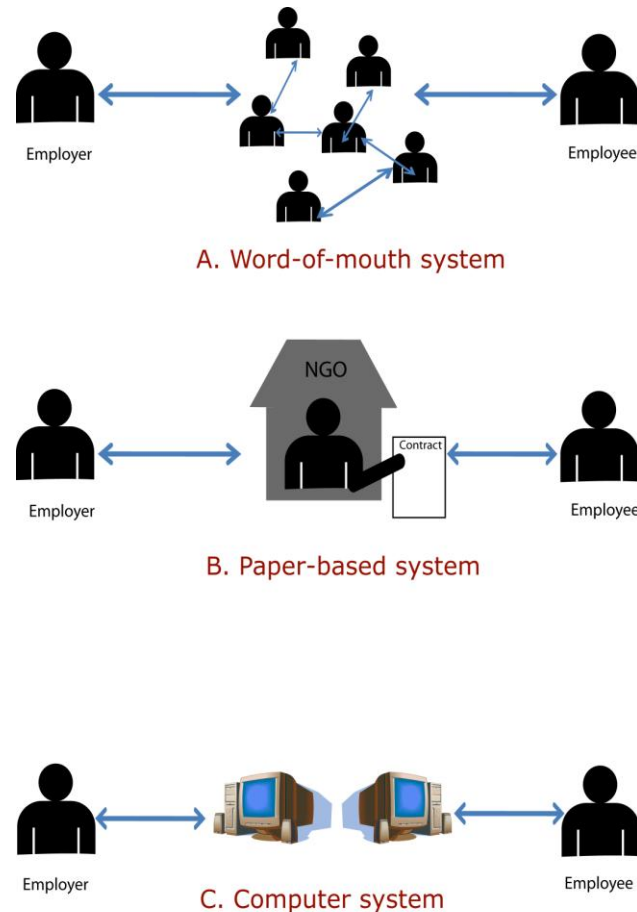
A. Word-of-mouth system

B. Paper-based system

C. Computer system

Fig. 1. (A) Word-of-mouth, (B) paper-based and (C) computer-based systems for matching employers and employees for domestic work.

Figure 1 (C) shows what we would like to accomplish, where employers and employees are connected via a computer network, possibly with some human help on the employee side. The primary advantage of such a system is textbook economics: It would eliminate inefficiencies in the market due to imperfect information, for example, by allowing prospective employers to post precise job descriptions and employees to search for the best-paying jobs. Such a reduction in "transaction costs" would lead to more income for the employee, more savings for the employer, and hopefully enough left over to cover the costs of operating the network [9]. Since PCs are not uncommon in employer homes and workplaces, and Internet cafés scattered throughout the city are accessible to anyone (typically at the low rate of US$0.25 per hour), this goal is feasible from the perspective of available infrastructure.

What was less clear at first was whether there might be other significant obstacles. We initially imagined that it would be as simple as setting up an Internet-connected PC "kiosk" in a slum neighborhood running the right software. But, this turned out to be terribly naïve; our first attempt immediately raised the following questions, for which there were no immediate answers:

- Where could we place a PC kiosk in a slum community such that it would be safe from theft and vandalism?
- Who would be qualified to operate and maintain the kiosk? (And, in the long-term, how would we cover their costs?)
- How would we get employees to sign up with the system in the first place? (There are accompanying deeper questions around trust.)

- How would we get employers to sign up with the system? (Again, trust.)
- Who handles things in the case of disputes?
- How do the employer and employee have their first conversation, assuming that they are matched?

In developed-world scenarios, similar problems might be addressed through traditional business practices, but we note that in the context of slums and a non-literate low-income population, even the most basic practices do not easily transfer. For example, one might think to advertise such a service through paper flyers, but this would fail to reach exactly the non-literate worker population we would like to reach.

Faced with these issues, we decided that we needed to perform an intermediate step. This intermediate step would implement the entire system end-to-end, provide scaffolding for an eventual computer-based system, and allow us to gauge the challenges and benefits of a computerized system… but, it would do so *without* actual computerization.

The remainder of this paper focuses on what we call our *paper-based* pilot (see **Figure 1 (B)**), the lessons we learned from it, and how they inform the eventual computer-based system. The conclusions from our case study are critical for the computer-human system that is our eventual goal, and we will discuss later why we believe they have application to other computer projects in support of poor developing-world communities.

Project Participants

The participants in this project comprise Microsoft Research India, and a non-profit, non-governmental organization (NGO), Stree Jagruti Samiti, which has worked for 15 years with residents of five slum neighborhoods in Bangalore, to improve their working conditions in domestic labor.

Project Duration

The paper-based pilot project has been running for since February 2007. During the first month, the project participants sketched out a plan for implementing the paper-based pilot. After that, there were two months of iterative prototyping during which we identified many of the difficulties described in the following sections, as well as our solutions.

Paper-Based Pilot

The paper-based pilot is a manual system of connecting employees and employers through a human intermediary. The pilot is a collaboration between Microsoft Research India and the NGO Stree Jagruti Samiti, in Bangalore, India. One member of the NGO, whom we will refer to as the *coordinator*, was responsible for operating the paper-based system.

18 apartment complexes (ranging from 15 to 100 apartment units each) formed the pilot test bed for this system. Pamphlets containing information about the employment service were distributed to individual households in these apartment complexes. Interested employers telephoned the coordinator mentioned in the pamphlet and provided specifications about the kind of domestic help which they desired, such as the chores to be accomplished, preferred frequency and schedule,

location of work, etc. This information was entered into a paper register manually by the coordinator.

On the employee side, the coordinator signed up a pool of domestic workers from the slums where the NGO operated, and similarly entered data into a paper register about employee qualifications and preferences. Information entered includes, for instance, times available, previous employment, etc.

Both employers and employees were given two options: (1) whether to interact and negotiate directly with candidate employees, or (2) to sign a contract stating formal terms in which employers agreed to be bound to certain conditions (among them, minimum wage terms), and the NGO took on the responsibility for the quality of work by the employee.

The specifications provided by the employers were matched with the pool of helpers by the coordinator. Once a match was found, the employer and employee were put directly in touch in case (1) above, or in case (2), a formalized process took place with a signed contractual agreement between the employer and the NGO. In both cases, the employer pays a small fee when a match is made (US$12 for case (1) and US$30 for case (2)).

The paper-based system has been in operation for eight months. Through the system, 1000 flyers were distributed in 18 apartment complexes, 400 enquiries from employers were received, 45 employees are registered, and 22 domestic workers have been successfully placed. More interesting than the numbers themselves, however, is what it took to achieve them.

Fig. 2. Employees of the worker pool with the coordinator at the NGO office

Fig. 3. Paper register with employee qualifications and preferences

Challenges Encountered

The paper-based pilot, as described above, was arrived at based on some initial plans and three months of intensive trial and error. We encountered a number of needs in this process, which we organize into five categories: the need for a formal organization, the need for basic skills in providing the service, the need for a strong value proposition, the need for technological literacy, and other miscellaneous needs. In this section, we outline these issues, provide examples, and describe how they were resolved.

Need for Formal Organization

In going from a word-of-mouth "system" to a computer-based system, a degree of organization and standardization is required. Coming from an environment where such standardization was completely absent, we found that it was necessary to expend effort determining just what standardization was required and then implementing an ongoing organizational structure that maintained those standards. In our case, this effort was undertaken by the NGO partner; in the general case, we feel it requires a formal (human) organization that puts the non-technical components of the system in place.

- Registering participants

When accomplished by word of mouth, there is no single entity that people go to to find jobs or post jobs. The first need then, for a formal service to do this, is to establish a unified interface for participants through which communication occurs.

This, in turn, requires a physical or virtual presence for the service and a way in which to inform potential participants of the service. Neither of these was trivial in a slum context. After much discussion with the NGO partner, we ultimately chose to establish a physical office co-located with the NGO's office and a single phone number where the coordinator could be reached. Housing the office in the NGO office was good for connecting with potential employees: it was close to their residences, they felt comfortable visiting the office (and in some cases, business was conducted at NGO meetings to which the employees came), and it was under constant supervision with the partner NGO. On the other hand, this location was not as good for connecting with employers: the location was not easy for employers to reach, and it was not credible as a formal office. However, we felt that it was easier to identify potential employers than employees, so we accepted this tradeoff.

As for advertising the service, we were able to use the NGO's own network of slum residents as well as word of mouth to spread the word that a new service was arriving.

- Standardizing a taxonomy for work

The employee-employer relationship in informal domestic labor is *ad hoc*, with exact terms of the work and pay negotiated on a case-by-case basis. Although we did not expect to standardize what work was done across households, it was necessary to standardize the vocabulary and taxonomy by which these were discussed, before a computerized system could be put in place.

For example, one of the first issues we ran into was differences in opinion on how to measure work. Employers hesitated to pay by the hour for fear of having to pay more to slow workers. Employees, on the other hand, did not want to be paid by chore completion for fear of hidden work within each chore (*e.g.*, does "washing dishes" include periodic cleaning of unused dishes in cupboards?). We could not standardize by the type of chore because it was difficult to identify and collate an exhaustive list of chores.

Ultimately, we settled on a core agreement for a family of four, with any additional tasks adding an increment. The following is a direct quote from the contract we finally worked out (working out these terms took two months of intensive interviews with both prospective employers and employees): "For a household of 4 people, fixation of wages will be on an hourly basis for the basic tasks of sweeping, swabbing, washing vessels and washing clothes @ Rs 450 per hour a day of work, for a month" (note that this means the worker receives 450 rupees [approximately US$11] per month, working one hour a day, six days a week). Increments in pay are then added (or subtracted) for additional (fewer) family members or additional (fewer) tasks. So, for example, if this same one hour a day also included, say, cutting vegetables (additional task), that would add an additional 50 rupees. Each additional family member meanwhile incurs a 10% increase per hour.
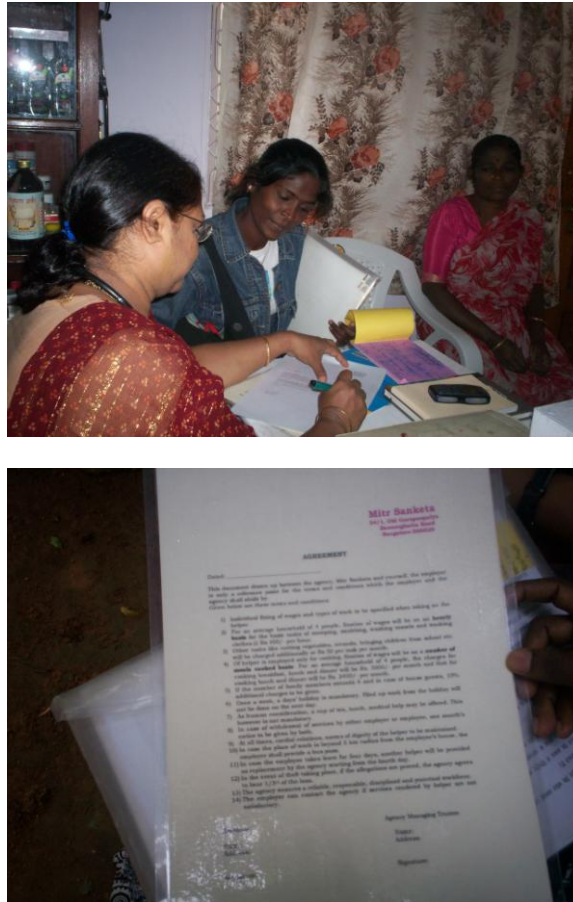
Fig. 3. (Above) Employer signing contract in the presence of NGO coordinator and employee. (Below) The contractual agreement

- Bearing trust and accountability

One issue that repeatedly arises when setting up new computer systems is the question of trust [3]. How can users gain trust and feel there is accountability in the system?

In our case, the NGO was particularly well-positioned to address issues of trust and accountability, for both employer and employee.

Without the NGO in between, employees felt little sense of responsibility and commitment; they would take absence from work without prior notice, or would do sloppy work. In the new paper-based system, if there is a contract in place, the NGO addresses issues of accountability by instilling a sense of responsibility among domestic workers and regularizing attendance. It also provides additional benefits such as investigations of suspected theft as well as replacement services when an employee is unable to work.

The NGO also acts on behalf of the employees, when employers abuse their position. For example, in one case, an employee complained that she was verbally abused regularly by the employer household. To investigate and resolve the matter, the NGO coordinator visited the employer's house regularly for one week. After detailed conversations with both the employer and worker, the matter was resolved.

Equally important in establishing trust is the perception that there is a party willing to take responsibility. From an employer's perspective, a mature NGO was more trustworthy than a single domestic worker. Similarly,

domestic workers felt they could trust an NGO they were familiar with to represent them to prospective employers.

We feel this issue is central to the setting up of any formal computer system where previously there exists only an informal system. In fact, as the pilot has grown by word of mouth to other slum neighborhoods, we have discovered that our NGO partner does not have the manpower to represent residents of slums outside of its normal working range, and thus, we have been unable to expand the project without additional NGO partners.

All of the above instances highlight the very central role played by the NGO in our pilot. In all cases, the existing relationships that the NGO has with the employee community helped to communicate with them and to establish trust. For the employers, the NGO served as a single point of contact and accountability. We note, in particular, that these functions could not easily be replaced by technology.

Need for Building Human Capacity

Separate from the need for a formal organization to act as an intermediary between employer and employee, we also discovered gaps in the employees themselves in providing the services that employers were requesting.

Once the paper-based system was implemented, we discovered that employee skills were not at par with employer expectations. For example, a large number of employers requested cooks who could cook a variety of meals. In addition, employers had requests for specific cooking styles - North Indian, South Indian, non-vegetarian, Jain food, etc. However, in the paper database, there were not enough employees who were capable of cooking dishes as requested; most of the workers knew a limited number of traditional dishes which they cooked for their own families.

In another case, a hospital was registered as an employer, and had specific requests such as formal housekeeping skills that included making beds in a certain way. Even such simple skills were not in the repertory of our potential employees, and ultimately, no one from our employee pool was placed in that job.

To meet these requests, the NGO has been conducting cooking and housekeeping workshops. (This provides yet another example of the value of a formal organization in the middle.)

More generally, these examples highlight the fact that when a computer-based system is meant to connect two groups, one of which seeks to provide a service for the other, the quality of service itself needs to be at some minimum level and something like quality control needs to be implemented.

Need for Strong Value Proposition

As mentioned, employers and employees typically use word of mouth to connect. This provides a baseline comparison for any formal system we might implement.

For all of our registered participants, the convenience of an agent looking for employer-employee matches provided the initial value proposition. Potential employees had nothing to lose, and potential employers

would register if they felt that the match fee was worth the convenience of a formal system.

In addition, for the case of contract-based agreements, we sought to add value to both employers and employees through enforced terms. For employers, having the NGO as intermediary provides accountability for a more reliable, possibly higher quality, service. Out of 15 successful matches so far, seven, or about half, opted for the contractual terms, even at the higher cost of a match.

Among the eight who declined, employers mentioned that they were not willing to enter into an agreement that could make them answerable to questions regarding their supervisory practices by the NGO. They were additionally worried that if a worker filed a complaint against them, the NGO would take the side of the worker.

The paper-based pilot thus shows that our scheme does provide some value proposition, with both employers and employees enjoying the convenience, and some employers further finding value in an exchange of reliability for greater cost.

Need for Technological Literacy

While the NGO helped us put all non-technical components of the system in place, we recognized that when it came to technological knowledge, they lacked competence.

Our ultimate objective was to create a fully functional paper-based system which could eventually house the technology. We hoped to introduce a PC into which the coordinator could input the employer and employee information. Based on the success of establishing a formal database, our hope was to eventually launch an employment kiosk in the slum using our previous work in user-interface design, where employees could access information. On the employer side, we hoped to ultimately establish an online database where employers could post their worker requirements. We observed that the NGO lacked the technological vision, resources, expertise and training to effectively host a computer-based system.

We recognized that for transitioning into a computer-based system, in conjunction to working with the NGO we will have to work with a partner who could provide the technological platform to host the computer-based system.

Miscellaneous

• Ensuring steady demand

For the paper-based system to run successfully, a steady demand for domestic workers from employers was necessary.

The NGO contacted the employers for participation in the paper-based system. During the first few months of implementation, the rate at which employer enquiries came in was low. The apartment complexes that we chose for the pilot test bed had been around for a while and most of these households already had domestic workers. So the challenge was to find newly built complexes which were not fully occupied. The hope was that the new residents would be seeking employees and would respond to our pamphlets. For a week's

time, the coordinator traveled around these neighborhoods trying to spot such newly built apartment complexes.

These experiences highlight the fact that in the computer-based system, instead of the NGO contacting employers, the set-up should allow employers to register on the system easily on their own. This will allow a large number of employers to participate in the system thus ensuring a steady increase in demand for domestic workers.

- Need for efficient communication modes with employers and employees

In the paper-based system, the NGO coordinator spent a lot of time contacting and communicating with the employers and employees.

While distributing pamphlets, it was difficult to obtain permissions from the maintenance bodies of the complexes to distribute door-to-door. Once the telephone enquiries started coming in, the coordinator had to set up individual face-to-face meetings The NGO had a small office space in an old unimpressive building of a low-income neighborhood. One reason for worry was that this space would not cast a credible impression in the employers' minds. So the difficulty the coordinator faced was to politely refuse the employers' requests to visit the NGO office and instead personally visit their homes to set the up the contract, collect fees etc. Initially this was relatively easier to handle, but as the number of calls increased, the increase in the number of home visits became increasingly difficult to manage.

On the employee side, the coordinator communicated information about a prospective employment when she visited the slums on one of her bi-weekly visits. Gradually as the number of calls increased, the number of visits to the slums had to increase and it became increasingly challenging to manage this. Most employees in the pool did not have telephones and the only way to communicate with them was to visit them personally. Once the employee agreed to the employment specifications, the coordinator also had to accompany her to the employer's house on the first day.

These experiences highlight that the computer-based system should make it easier for both employers and employees to participate in the system. The registration process for both user groups should be so easy that the NGO does not invest time and effort participating in this routine operational activity and instead diverts efforts to more critical activities.

- Need to address legal issues

Once the employers started paying fees for the services, the NGO started accumulating funds.

One reason for worry for the NGO was that gradually as the service started generating more revenue, the need for registering this service augmented. This registration had to be done at the Labor Commissioner's Office. The bureaucratic processes in this organization would delay the registration process indefinitely.

We realized that processes and strategies had to be built to handle this situation soon.

Recommendations for a Computer-Based System

Although the primary goal of our paper-based pilot was to provide an intermediary step to a computer-based system, there are some things we learned that suggest modifications we should try in our computer-based system. Our original plan was something along the lines of an online job-search site (e.g., Monster.com) with the provision of dynamic webpages designed to be understood by non-literate users. However, this again seems naïve in retrospect. We believe the following features might help establish and scale a computer-based system for low-income domestic workers.

Trusted intermediaries as first-class entities: Unlike existing online job sites in developed countries, where the computer system replaces the intermediary altogether, in our case, a human intermediary seems a necessity, at least for some time to come. Thus, it would make sense for a job-search application to provide them with an online identity, as well. Such an identity could be the basis for any of the following:

- Online certification of employers and employees (a formalization of reputation and rating systems on sites such as eBay and Amazon.com)

- Intermediaries as mediators who interact directly with employers and employees in dispute resolution.

- Guardians of employee accounts. Given that many employees may not be familiar with computer use, intermediaries may need to register employees with the system, etc.

Online social networking: Even with our attempts to create a single point of contact for both employers and employees, we still found that a lot of information flowed by word of mouth. For example, quite a few of our registered employers heard about our project through their friends, and not directly through our flyers. We could augment these channels through online social networking, possibly working in conjunction with sites such as Orkut [www.orkut.com], which are designed to facilitate trust relationships beyond one's immediate circle of friends.

Provisions for variable contracts: We found that there was demand for clear contractual agreements that enforced certain behaviors on the part of both employer and employee. The process of negotiating contracts could be put online.

Related Work

The focus of our work was on the challenges of setting up a formal computer-based system where little resembling a formal system existed to begin with – a frequent feature of communities in developing countries.

The challenges we identified are echoed in the model for evaluating performances of information systems in developing countries proposed by Richard Heeks [3]. This model discusses issues with respect to information gaps, human capacity, lack of organization, which restrict the successful introduction of technology into manual-paper based systems. These issues are said to create a mismatch between proposed designs of

information systems and 'local actuality' of broken manual systems. The analysis of various case studies based on this model shows that it is important to first ensure that these issues are addressed, thus enabling the paper-based system to be fully functional and conducive for the introduction of technology.

In our work, we recognized very similar issues up front, and therefore used the paper-based pilot as an intermediary step during which we could create or buttress the essential "soft" system that needed to be in place for an effective computer-based system to take root. We found that many of our difficulties matched Heeks's categorization of problems, with exact matches in "human capacity" and "lack of organization". In addition, his "information gaps" could be seen to correspond with the need for technological literacy that we identified. Finally, what we determined to be a value proposition of the formal system (that exists in our design for both paper-based and computer-based systems) could be construed as part of the need for organization that Heeks outlines, although we feel it is a slightly different need that speaks to the likelihood that the system will be taken up by users, given that an informal system to accomplish the same task already exists and is widespread. Finally, we mention that while our work confirms Heeks' observations, it provides evidence from a constructive point of view: we identified these problems in the process of trying to set up a real computer-based system, and provided solutions, in addition to identification of challenges. Our paper-based system ensures that a fully established, stabilized system exists before we introduce technology.

There are two projects which are particularly relevant to our work. These look at providing information and communication technology to a previously broken informal system in which underserved communities are connected with user groups who are in need of their services. One such project is the ITC e-Choupal project where rural farmers are able to sell their agricultural produce to ITC Limited, a large agricultural processing company [1]. The system uses technology to tackle the challenges posed by the unique features of Indian agriculture, characterized by fragmented farms, weak infrastructure and the involvement of numerous intermediaries. Another such project is the e-commerce project by Drishtee and Microsoft which uses technology to allow rural artisans to sell their paintings and artifacts to buyers in cities directly by circumventing informal agents [8]. These two projects successfully address the challenges we had identified in setting up a computer-based system, although to different degrees.

The Drishtee artisan project follows a model that addresses the challenges discussed above in a unique way. Drishtee as an organization itself plays the role of the intermediary and thus meet the need for a *human organization* for implementing quality standards and formalizing agreements. The artisans prepare designs, and the organization chooses which designs are to be showcased on the Drishtee online store. Thus, a high standard is set for the designs to be able to cater to a world market. Strict quality control ensures that artisans who are a part of this system are well-trained and that their output meets certain standards of quality. This ultimately builds strong *human capacity* into the system. Because of availability of the best designs on this platform the value proposition for the

buyer is strong enough that there is little motivation to choose *alternative channels,* which, in any case are less convenient as they require trips to faraway markets*.* A computer-based system has since been overlaid, successfully. Artisans also use other computer-based tools such as the pen-based Tablet PC for designing patterns and entering drawings. All such technology is ultimately handled and maintained by Drishtee, and so the need for *technological literacy* is met.

The Drishtee artisan project has not reached a significant scale, however, and it does not appear to be, due to limitations in the computer system which is quite easy to scale. Rather, we believe it is because of the limitations of the human system required to support it. In particular, due to the effort required to maintain quality and to integrate new artisans into the system, significant manpower, not available through Drishtee itself would be required to build a greater and more varied supply of handmade crafts.

In the case of e-Choupal, the role of the *human organization* is being taken care by ITC Ltd, an agriculture conglomerative. ITC establishes its own rural marketplaces where it can enforce fair practices and the farmers are assured of prices which are competitive with the world markets. These modern markets are equipped with computers which help run the entire system. The company has strict quality control measures in place to ensure best produce for the buyer (ITC itself). Farmers are therefore incentivized to provide high-quality produce, and ITC is happy to provide agriculture extension services that further educate farmers. This builds strong *human capacity* into the system. Lower cost for the buyer, higher price for the seller, and better guarantees of quality on all sides produce a clear value proposition for all concerned; there is literally no motivation to revert to the older, *alternative system,* which was a traditional market where middlemen used hardball tactics to force farmers to accept lower prices for their harvest*.* ITC itself has prepared the technological platform for the system and has also appointed a coordinator in all villages to help farmers to use the system thus ensuring that the system overall is *technologically literate.*

What is interesting about e-Choupal has been its ability to scale the system across several thousand villages. This was driven purely by business goals. Because ITC realizes lower costs for its inputs by implementing a system that cuts out the middleman, every new market it establishes contributes to its long-term bottom line. In addition, ITC has since begun to use its markets as a place to sell processed foods back to farmers, layering yet another business opportunity onto its investment in building the markets.

Conclusion

In this paper we examined broad challenges facing a computer-based system to help match low-income domestic workers from an urban slum with potential middle-class employers in Bangalore, India. Due to the near impossibility of implementing such a system in one step, we first implemented a paper-based system that provides the intended functionality but without a computer. Among the lessons learned were the crucial role of human intermediaries (necessary even in the final computer-based system), the importance of building skills among the domestic workers, the need for a strong value proposition for both employers and

employees well above existing systems, and the requirement of technological literacy.

By analyzing these issues in the context of related projects, we see that the challenges we identified exist for information systems across at least two other domains in developing country contexts, and we believe a generalization of our specific findings have even broader applicability. In conclusion, for a technology to be successfully situated into many developing-world contexts, it is important to first ensure that the proper social, cultural, physical infrastructure exists, and if not, to build it.

In future work, we have decided to partner with a local start-up venture that has implemented something very similar to the computer-based system we have implemented, and is currently in the process of setting up intermediaries across the city. We have provided our understanding of the paper-based pilot to them, and they have made a number of adjustments in their execution strategy according to our guidelines. Ultimately, our hope is to see the full system in operation, so that we can finally see our user interface for non-literate users in action… the idea is to allow non-literate domestic workers to directly interact with the computer, should they so choose.

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