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TEXT-FREE UI: PROSPECTS AND CHALLENGES FOR ICT ACCESS

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Abstract: This paper examines the constraints that mediate the ability of individuals in developing country contexts to benefit from Information and Communication Technologies (ICTs). We identify social constraints, such as low levels of education and literacy rates, as making it difficult to access ICTs. We outline an innovative approach to address these constraints with a text free user interface (UI) design of an application for the illiterate population. We apply this text free UI to the case of a problem that ICTs hold the potential to influence—informal domestic labor markets in Bangalore, India. We examine the potential of the text free UI application and present preliminary results from user testing. These tests examine whether individuals without prior computer skills and low literacy levels could successfully navigate and access employment information. We flag challenges in promoting access to ICTs with this application, given the multiplicity of ways in which people derive benefits from technologies, the difficulties in formalizing labor relations and informal dissemination of information.

Keywords: Information and Communication Technologies, Access, Illiterate populations, User Interface, Design

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1. INTRODUCTION

Increasingly, multilateral organizations, NGOs, governments and private companies are trying to address the 'digital divide' by using Information and Communication technologies (ICTs) as a tool for economic development and poverty alleviation in developing countries (Keniston 2002; WorldBank 2003). For example, ICTs have been used in targeted interventions to address problems in agriculture, education, and health (Brewer et al. 2005). However, physical, capital and social constraints can mediate the ability of individuals to benefit from ICTs. Given these constraints, access to ICTs can be highly differentiated, particularly when these constraints occur within a developing country context. Despite these efforts to target rural areas and other groups through the application of ICTs, research shows that social constraints, such as education and literacy levels, can mediate the ability of illiterate populations to benefit from technologies (Best and Maclay 2002). Marginalized groups tend not to benefit from these technologies due to low literacy rates, income and/or fear of technologies. Few computing applications because of the heavy use of text are accessible to illiterate people.

This paper examines the constraints that mediate the ability of individuals in developing country contexts, particularly India, to benefit from ICTs. We identify social constraints, such as low levels of education and literacy rates, as making it difficult to access ICTs. We outline an innovative way to address this constraint with a text free user interface (UI) design of an application for the illiterate population. We apply and test this text free UI in the case of one problem that ICTs hold the potential to influence—informal domestic labor markets in Bangalore, India. There is a large surplus of labor of domestic workers, since women from slum communities in Bangalore find it difficult to identify and approach potential employers. Within this situation, there is no formal system by which employers can identify domestic workers for employment. The application aims to address the inefficiencies of the informal domestic labor market given the lack of formal information exchange.

In this paper, we describe this application within the context of accessing ICTs and the target community it tries to address. We present preliminary results from user testing and highlight the potential use of such a text free UI application. These tests examine whether individuals without prior computer skills and low literacy levels could successfully navigate and access employment information. We also flag challenges in promoting access to ICTs with this application, given the multiplicity of ways in which people derive benefits from technologies, the difficulties in formalizing labor relations and informal dissemination of information. Despite the fact that the provision of market information through ICTs is often hyped as a solution to labor market inefficiencies, actual implementation proves difficult given the different incentives for employers and employees to adopt such a system. We recognize that this technological application is one aspect of a much larger challenge to address the informal domestic labor market.

2. ICTD INITIATIVES AND ACCESS

2.1 Access and Technologies

The 'digital divide' is broadly defined as the difference between information 'haves' and 'have nots (Castells 2000).' The OECD defines it as the "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their

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opportunities to access information technologies and to their use of the Internet for a wide variety of activities"(OECD 2001). Norris (2001) examines this idea of the Digital Divide, particularly in trying to understand whether the Internet will serve to reinforce or erode the gap between information rich and poor groups. The debate over the digital divide is often seen as binaries: as a debate between cyber optimists who hope the internet can reduce traditional inequalities between information rich and cyber pessimists who think that technologies just adapt to the social and political status quo and leads to further stratification (Norris 2001).Eventually, the discourse moved beyond a problematic divide between skeptics and optimists and whether or not to use ICTs or focus on development to a focus on 'access.' This debate focused on the divergence between technological drivers and potential beneficiaries.

'Access' in the context of ICTs and development is often discussed in relation to access to markets, business services, public services, and information (Sun and Wang 2005). Specifically, access to markets refers to the potential that ICTs can connect individuals to formerly inaccessible markets. This can be assisting rural populations to access urban markets, farmers accessing commodity information, or laborers participating in markets that were previously not formalized. For example, the provision of market information has been acclaimed to be a valuable benefit of ICTs in rural areas to farmers because it is supposed to create better functioning markets, get rid of intermediaries and allow for increased participation in global markets (Eggleston 2002). ICT kiosks for farmers in rural India have been lauded for organizing farmers and "providing them with a two-way means of selling and buying that both opens markets and empowers the poor" (Prahalad 2001; EIDParry 2004). According to economists' definitions, markets are a set of transactions over a range of goods and services, which allow for mutually beneficial exchange (Ibid). Information plays a great role in the coordination of markets and allocating resources efficiently. In such rural settings, there are virtually no sources of information about production or market prices (Eggleston 2002). Second, access to business services refers to how rural enterprises can gain access to higher quality lower cost business services through electronic delivery. Third, access to public services means that citizens can get improved access to public services such as health and education services because of the Internet. Fourth, access to information means that with improved information sources individuals gain valuable knowledge that they did not have before (Sun and Wang 2005).

2.2 Constraints to Access

We will now examine issues of access to ICTs by focusing on understanding the multiplicity of constraints, which influence how people derive benefits from technologies. Scholars often approach issues of access to ICTs by looking at three types of constraints: physical constraints, capital constraints, and social identity constraints. We do not presume that any of these categories are mutually exclusive. In fact, there are multiple ways in which these issues are inextricably linked.

By focusing on physical constraints to understand access to technologies, scholars link access to a physical ICT infrastructure and availability to rural populations (Brewer et al. 2005). In this case, access depends on availability of technologies and infrastructure. Studies indicate that ICT infrastructure access is not geographically or spatially even (Sun and Wang 2005). In this case access to high-speed networks and broadband penetration differ by location. However, only using physical constraints such as penetration and technological availability as ways to approach access limits one's understanding of how there may be social or economic differentiation among the rural populations who access technologies. It can neglect how particular processes, such as accessing technology, are influenced by larger political issues such as attaining credit or capital or one's social identity.

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Material inequalities of access, particularly in terms of capital, are important to consider because they highlight some of the causes of poverty and wealth inequalities. Access to capital is a constraint, which mediates the ways people, benefit from ICTs since households cannot always afford to pay for ICT services or purchase ICT equipment. Having access to capital determines who is able to benefit from ICTs by controlling or maintaining access to them. With limited access to capital, this can limit acquisition of ICT services as well as opportunities for households to improve their own situations (Ribot and Peluso 2003; Brewer et al. 2005). The distribution of benefits of ICTs is dependent on access to capital for payment of services or initial investment in purchasing computers and ongoing maintenance of PCs. This often limits access to PCs and ICTs to high and middle-income groups (Menon, Kiri, and Toyama 2006).

Another way to analyze access to ICTs is through a lens of social identity constraints, equity and social differentiation, while focusing on power dynamics among rural households. Social identity constraints can mediate equitable access to ICT technologies and facilities particularly when there is a highly stratified society based on caste or religion and wide social differences. Although we split material and social constraints of access into different categories, there are numerous ways in which they overlap. Inequality in access can result when the population is differentiated along ethnic, religious, linguistic/cultural, caste and class lines (Ribot and Peluso 2003). This is particularly salient when these sectors are considered to have differential rights, involving domination of one by the other (Pearse 1980). Accessing ICTs can depend on the particular social identity of the individual or group. For example, certain castes may be prohibited from using ICT rural kiosks that are operated by other castes (Kumar unpublished). Furthermore, levels of education and literacy levels act as a constraint that determines who is able to benefit from ICTs. It is often assumed that users of ICTs are literate or semi-literate given prevailing user interface requirements.

Finally, another way this concept of access has been described is incorporating notions of bundles of power as nodes in larger webs of power that can be separated into their constituent strands (Ribot and Peluso 2003). These strands within the webs and bundles of power can be viewed as the means of processes and relations by which actors can gain, control and maintain access to technologies. This definition of access, in terms of relations of power, can be a useful way to understand the terms by which households are able to attain the benefits of ICTs.

In sum, by examining physical, capital and social constraints when understanding access to technologies, it becomes possible to understand some of the material and social inequalities related to benefiting from ICTs. Physical constraints in terms of availability of a network, connectivity, and actual numbers of PCs available in a village can influence whether individuals benefit from ICTs. Material inequalities such as variations in levels of income, one's ability to gain credit, or purchase PCs are important in determining one's access to ICTs. Furthermore, social identity, in particular caste, social networks, status in society, and levels of literacy can determine the ways in which households access ICTs. Some of these studies reveal that particular outcomes, such as equity, whether it is differential attainment of capital, credit, proxy for access. Relations of power are undoubtedly linked to these constraints and unpacking these relations can provide further insights into how households and individuals mediate the ability to benefit from ICTs.

For the purposes of this paper, we focus on social constraints (particularly in terms of education levels and literacy) to access to ICTs and propose one possible way to address these constraints. We recognize that this application may not address the multiplicity of constraints that individuals

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face when trying to access ICTs. However, we will outline this application that aims to address access to ICTs as well as the challenges we see in terms of actual implementation.

3. CONTEXT

In Bangalore, there is a surplus labor of domestic workers, since women from slum communities find it difficult to identify and approach potential employers. The nature of labor is impersonal in that there is no formalized process by which women can talk to employers. The process is usually based on word of mouth, and these women rarely have formalized contracts with their employers. They may work for years and months without benefits, holidays, or guaranteed salaries. Presently, many employers take advantage of this situation and women are made to do more work than was agreed upon when joining, and do not receive extra wages for this additional work. Employers, however, are also at risk in this relationship and insecure in terms of losing workers at any moment, since there are no guaranteed contracts and employment is based on honorary service. Many part-time domestic helpers do not maintain regular work hours or they may show up to work sporadically. Few of these women have access to information regarding employment opportunities and available employees. Additionally, as an increasing number of employers are recent migrants to Bangalore (often working as part of the emerging IT sector), traditional systems of using social networks to identify employees becomes more difficult. Thus the informal labor market is fraught with problems for both employers and employees rooting in information scarcity and lack of formalized contractual agreements.

4. TEXT-FREE UI

4.1. The application

Specifically we explore how the use of ICTs through a text-free user interface (UI) holds the potential to partially address these labor problems by connecting women from urban slums in India with information about employers who are in need of their services. Because many of the women from the slums are illiterate, we designed a text free UI application prototype for employment search. The aim is to make information about employment opportunities accessible to illiterate domestic laborers. The application gives the user group a wider range of choices to meet their specific needs, unlike in the present situation where the process is informal, inefficient, and mediated by self-appointed agents.

We envision the final application to be a web-based application with a backend database. Through the web-based application, employers will specify their requirements from their PCs. This information will get stored in a database and domestic helpers will be able to see the same information at community kiosks in a Text-Free form of UI. The helpers will be able to use this information to apply for jobs which match their specific needs. The plan is to have a trusted intermediary organization like an NGO, host this service, set up agreements, establish fair practices, and resolve and negotiate employee-employer interactions. Currently a manual system for this service has been set-up as a pilot project to understand feasibility and interest where the NGO is hosting this service. We will describe this in further detail below (See section 6). Presently, the technological application has not yet been introduced. Before introducing the Text-Free UI application we are trying to understand if formalization of the labor market is possible.

The application is designed so that first-time, illiterate users can successfully navigate through a computer application on their own with minimal assistance. It consists of UI components which, together, can lower the barriers to computer use for this user group by providing them with semi-abstracted cartoons for graphics, audio output, a consistent help icon and movie dramatizing the

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purpose of the application. Through this application domestic helpers can look for a variety of information about employment opportunities including: specific tasks requested by the employer, hours to be worked, total wages to be paid (and break-up of wages by task), geographic locations of the employer, and numbers of rooms and people in the residence.

The application contains the following pages: a context setting page, an introduction page, a page allowing users to select jobs by location, a job overview page, and a job description page.

1) **Context-setting page:** This page consisted of a video, which included dramatizations of how a user might use the application and how relevant information comes to be contained in the computer, in addition to a tutorial of the UI. The video had dramatizations of the scenario in which the application would be useful and how the relevant data was ultimately input into the computer. It would run in a loop at the beginning of the application. By clicking over this movie, the user would be able to go to the introduction page.

2) **Introduction page:** The first page consists of an icon, which represents job information for employees. This page is intentionally simple to avoid overloading first-time users. Even "decorative" text was removed so as not to intimidate illiterate users. On clicking this icon, one arrives at the Location page.

3) **Location page:** The user can retrieve information about how many jobs are available in a particular location. By clicking the mouse over a landmark, such as a hospital, restaurant or government office, the name of the location is called out, and the rectangular icons animate into an enlarged image of the landmark. By clicking on one of these rectangles on the map, users can navigate the Job Listing page.

4) **Job Listing pages:** In these pages, the jobs available in a neighborhood are listed by icons along with the basic picture information about each job. In order to proceed to detailed job descriptions, the user must click anywhere within a particular row of information.

5) **Job Description page:** This page compiles all of the relevant details about a particular job without using text. This includes information about addresses of the potential employer, wage break-ups, chores to be performed, number of rooms in the employer's house and the work timings with voice descriptions on mouseover. On every page, there is a "back" button to return to the previous page.
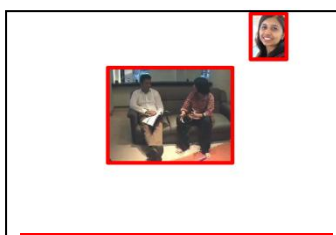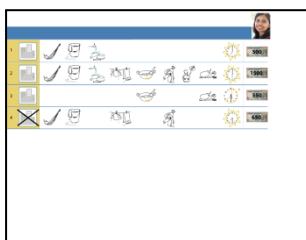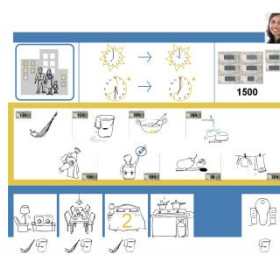

Context-setting page   introduction page   location page

job listing page   job description page

Figure 1. Screenshots from a text-free job-search application.

4.2 Methods

In designing the UI, we drew from guidelines of *contextual design* and *goal-driven design,* in which techniques of ethnography were used to gain a deep understanding of the subjects, within the context of their specific goals (Cooper and Reimann 2003). It is a process which focuses on observing and understanding users in specific contexts, analyzing and synthesizing information gathered, and incorporating these insights into a design. The goal of ethnographic design is to make the most of user experience. For this purpose, it becomes important to check the design innovation with the user group at each step to understand the problems in design and accommodate changes in the next iteration (Parikh, Ghosh, and Chavan 2003a; Parikh, Ghosh, and Chavan 2003b). We held open-ended interviews and conducted subject trials with our target communities, both with literate employers and illiterate and semi-literate domestic helpers. The ethnographic study of illiterate helpers involved over 250 hours of open ended interviews with 115 women in three urban Bangalore slum communities.

We visited individual households in the slums in order to talk to women in focus groups about their daily activities and to observe their living environments. Through open-ended interviews and participant observation techniques, we explored women's economic relationships, and their communications and interactions with people within and outside the slums. We also explored their information needs. This gave us a broader understanding of the local context and needs. While choosing the participants for the interviews, we selected women from a range of low income groups and varying levels of technological familiarity with productions and applications.

Subsequently, we used an interactive design process to develop the UI, which required constant feedback from the employees with each iteration. We used this information to evaluate our designs and incorporated the necessary changes into each following prototype we designed. Being accepted and trusted by the community, making the subjects feel comfortable to voice their opinions and feedback about the UI, helping them overcome their fears and reluctance while using technology were a few of the challenges we faced during the process of design.

We had to take various actions to accommodate subjects and make them feel at ease. We spent considerable time in the community, attending weekend meetings to understand the context, culture and practices of the users. We visited the communities on an average of two to three times a week, for three-four hours each session, for 15 months.

We also conducted 35 usability tests with 35 illiterate subjects. We defined a task for each of the users and embedded tasks into a story[1] like in the "Bollywood method" (Shaffer 2004). In this method, tasks are embedded in dramatized stories involving the subject, which has been found to be better at motivating subjects toward the desired tasks, even for computer novices. Particularly in a context with asymmetric power relations, and where subjects tend to be reserved about giving feedback to people they perceive to be in authority (as test administrators were perceived to be), this became an invaluable tool for encouraging honest feedback.

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[1] We told them the following story: A friend of theirs who lived in their neighborhood was in trouble and desperately looking for a job. Their objective was to find the best paying job in a nearby neighborhood and to be able to report the address of the potential employer. (We initially started by asking them to find a job for themselves, but switched to this scenario after one woman in one of our earlier trials, seemed agitated by the idea that she would need to find herself a job and if she was losing her current job.)

4.2. Target population

The target community this project aimed to address is any first-time, illiterate user. For the purpose of our study, we chose a group of employees or domestic helpers[2] who closely matched the criteria we had for our target population.

All of the subjects we worked with had the three characteristics we sought to address in our work: (1) functional illiteracy or semi-literacy; (2) low levels of formal education (highest education attained being schooling up to the sixth grade); and (3) no experience whatsoever using a computer.

We based our project in three urban slum communities in Bangalore, India. To gain access into these communities we worked with an NGO called Stree Jagruti Samiti, which has an established presence in these three slums for 15 years. The NGO has been involved in working for the rights of women in the unorganized sector, at their workplaces and in their homes. It has 7 full-time members currently working towards formalizing and establishing minimum wages for the unorganized sector of domestic labor workforce. The NGO has a two room office and is located within 3 kilometers radius of all the slums with which they work. The NGO office has one computer with Internet connection and a landline phone. Weekend meetings are held at the NGO office and these are attended by the both NGO workers and women from the slums who are NGO members.

Most of the women in the slums work as domestic helpers, either illiterate or semi-literate (highest education attained being schooling up to the sixth grade). The male members of the house are generally hold jobs such as daily wage laborers like plumbers, carpenters, construction workers, mechanics, and metal bar benders, fruits and vegetable vendors. Their primary language of communication is Kannada, their native language. Apart from this, a few people also spoke Hindi and Tamil. The average household income was INR 800 - INR 3000 (approximately USD 18 – USD 67) per month. A few of them also had television sets, music players, and liquid-petroleum gas burners. Some of them have seen computers in the houses of their employers, but due to class and caste-based discrimination were prohibited from touching the computer even for the purposes of cleaning. None of them had previous experience using a computer.

The women in these communities worked at one to five employers' households and also did most of their own household chores. At present, they indicated that they get job information through word of mouth or through agents within the slum who informally connected employers with employees. Most of the women had limited options and often continued working at the same place for low wages because they were not aware of better opportunities elsewhere. We also found that many helpers would be happy to take up an additional job that involved small workloads because it would help them earn more additional income.

Focus-groups with employers show that there is definite interest among employers for a more formalized system. Employers we interviewed expressed that if there were an intermediary organization to take responsibility of the labor market connections, issues of accountability could be better addressed than in the current informal social network system. They felt that if necessary prior information (where the helper lived, where she worked earlier, and recommendations from previous employers) were available about the prospective helper then this system would be a more convenient method of connecting to helpers. Illiterate domestic helpers with whom we tested this application were able to successfully navigate the application with minimal assistance and found value in such a service.

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[2] From here on we will refer to employees as helpers.

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The employers interviewed were all literate. The average household income per month was INR 100,000- INR 150,000 (approximately USD 2200- USD 3300) which is classified as the upper middle class household income bracket in India (Bery, 2004). 40% of the households interviewed were double income families. Most of the families had home PCs and the women in the family also used these PCs. Most of them lived in their own two-three bedroom apartments.

These employers currently found domestic helpers through informal social networks. For example, security guards of apartment complexes often arrange for someone from a nearby slum to work for the employers through a point of contact in the slum. Most employers paid an average of Rs. 1000 (USD 20) per month to their domestic helpers for the chores of sweeping, swabbing and washing dishes. They felt that there was a lack of accountability among their current helpers and a definite need for sense of responsibility and commitment. They said that most of their helpers were irregular at coming to work and would do so without prior notice. From our interviews, they indicated that they were welcome to the idea of a system that would address the issue of accountability, instill a sense of responsibility among helpers and regularize attendance.

5. PRELIMINARY TESTS AND RESULTS

We conducted a comparative test of the employment-search application with three configurations: one that was text-based, one that was text-free with video and one that was text-free without video. The goal of the tests was to understand whether first-time illiterate users could successfully use a computer application to extract relevant information without assistance. We performed the testing in a physical setting which was routine for the participants. In some instances, we visited subjects in their own homes (in slum neighborhoods of Bangalore); in a few cases, we conducted tests in the homes of their employers.

Throughout our design iterations and formal subject studies, we made a number of observations. We saw that overall there was a lot of excitement and enthusiasm among our subjects about the application. Furthermore, the application generated remarkable interest with the overall slum communities where we had based our project. Slum residents who had not had a chance to take the formal usability test heard about the project from their neighbors who had taken the test, and were eager to try out the application. Most subjects felt that the application would be very beneficial when deployed because they would be able to choose from more employment options and would be better aware of paying jobs. Some subjects who were not allowed to touch computers at their employers' houses were proud that they had finally used a computer. They expressed that they would inform their employers about how successfully they had navigated through the application. Results suggested that illiterate subjects could successfully interact meaningfully and independently with a computer application on their first contact with a computer, providing that the user interface and interaction design are appropriately designed.

5.1. Quantitative results

All 100% (35 participants) successfully completed the task in the text-free version with full-context video. The average number of prompts required was 5.2 and the average time taken drastically reduced to 7.5 minutes.

5.2. Qualitative results

Collaborative use: At one point when we were conducting subject studies, a group of women began playing with the application between our formal test sessions. As they seemed more

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animated, we allowed them to continue for some time. In our individual tests, subjects appeared nervous and uncomfortable, probably because they were being video-taped and scrutinized in isolation in front of researchers. The group, on the other hand, seemed more confident, suggesting ideas to one another, discussing the purpose of the application, advising each other, and interacting more boldly with the computer. There was more excitement among respondents, compared with single-subject tests. This suggested the potential for a future design with a collaborative user model.

Immediate comprehension of voice feedback: With almost no exception, we found the same reaction to those who were exposed for the first time to voice feedback in their own language: Most expressed a positive response to hearing a computer speak in their native language, and went as far as to call others in the vicinity to hear for themselves. In fact, voice feedback appeared to make the applications *enjoyable* for subjects, who seemed more engaged and eager to explore the application.

The value of help: In addition a "help" feature shortened the time that tasks were completed in the employment search application and also acted as a source of reassurance to users. There were occasions when before performing a task on a particular page they referred to help three or four times. Similar to the voice feedback, the "help" feature encouraged users to explore the text-free UI, without assistance from researchers. In one of the sessions, we observed that subjects went to the help icon themselves without any prompting and performed the actions exactly as told by the help. The same pattern continued for forthcoming screens and before taking any further action, they referred to help. Throughout the study, we found that we needed to prompt and encourage subjects to try out things on screen. It is possible that a few encouraging voice instructions telling users how to operate the tool would be helpful.

Navigation metaphor: In our employment-search application, we felt that subjects were more likely to understand hypertext navigation when they were told to think of the pages as pages in a book. Although no quantitative studies were performed, the most recent version of the help recordings that made this analogy seemed to be more helpful than earlier versions.

Subject involvement among test subjects: One thing we found repeatedly among subjects who were most comfortable with the application was that they were eager to give us advice about design and potential features. Some subjects suggested that there should be a way to contact the employer with questions or salary negotiations.

We saw that both our illiterate and semi-literate subjects got very anxious when we showed them the text-based UI. Even subjects who could read isolated words needed significant prompting.

The value of the movie: We saw that using a video in addition to the UI instilled a great amount of confidence among the test participants. They seemed to feel that if the domestic helper shown in the video could successfully get a job through a computing application, they would be able to as well. Our subjects got a much better sense of the purpose of the application and its use after watching the video. They also understood where the information came from and how the jobs were created, which they had not understood earlier. The dramatized video helped to put the story in a context to which they could relate. Our subjects were so excited about the video that even after the tests, they continued discussing that the wages suggested by the employers in the video were inadequate. Some subjects even began to offer recommendations, suggesting that there should be a way to contact the employers through the application so that they can negotiate their wages.

6. CURRENT SYSTEM SET-UP

We have started a pilot project to test the feasibility and challenges of how the text free UI for employment purposes may work in practice. Before applying a technical solution with the text free UI to address these labor market issues, we are initially using a low-tech solution in order to see whether the formalization of the labor market is even possible. The low-tech solution consists of a manual system of connecting employees and employers and formalizing contractual labor relations using an intermediary such as an NGO.

Currently, the NGO previously mentioned is hosting this service and the pilot project has been running for three months. In the current low-tech solution, 10 small and medium size apartment complexes have been chosen as the pilot test bed for this system. On the helper side, the NGO has collated a pool of domestic helpers from the slums with which they work.

Pamphlets containing information about the employment service were distributed to individual households in these apartment complexes. Interested employers can telephone the point of contact at the NGO mentioned in the pamphlet and provide specifications about the kind of domestic help which they desire. This information is entered into a paper register manually by the contact person. The specifications provided by the employers are matched with the helper profiles and their needs from the pool of helpers. Once the best match is decided, the recruitment process begins.

The formalized recruitment process is done under a contract that is established between the employer and the NGO. There are two schemes that are currently available to the employers to participate in the contract. In scheme I, the NGO finds a helper for the employer and thereafter does not intervene in the relationship between them. In this scheme, the NGO does not bear responsibility of the helper provided. The NGO charges a helper finding fee. The wage for the helper is negotiated between the employer and the helper.

In scheme II, the NGO first finds a helper and then enters into an agreement with the employer. Both the employer and the employee have to abide by the clauses of the agreement and the NGO bears the accountability of the employer-helper relationship. There are standard wages for domestic chores under this scheme. A higher fee is charged by the NGO for this scheme and additional benefits are provided such as finding a substitute helper when helper is on leave, verification on account of suspected theft by helper etc.

Since this process is still in the fledgling phase, we are still observing the weaknesses and challenges in the system. But similar to the design process, the system will be refined based on feedback from both employers and helpers. Eventually, if the low-tech system becomes established and functional for both groups, we will introduce a PC into which the coordinator can input the employer and helper information. Based on the success of establishing a formal database, our hope is to eventually launch an "employment" kiosk in the slum using text free UI, where women can access information. On the employer side, we hope to ultimately establish an online database which can be accessed remotely. We recognize that this process will be slow given the realities of working in the current social, cultural and technical environment of informal labor relations and with illiterate populations. But we plan to observe each phase of the process in order to best inform the resulting system.

7. SUCCESSES, CHALLENGES AND OPPORTUNITIES

Based on our qualitative research and usability tests and given the complexities of formalizing informal labor relations we will now highlight the challenges involved in promoting access to employer information,. We will also point to a few examples of opportunities in which access to labor market information may prove to improve market efficiencies. We will look at incentives and challenges of such a system from both the perspectives of employees and employers.

For employees to engage:

There are several incentives for employees to engage in a more formalized labor process. This could help ensure them a fair wage, contract, and some basic rights. However, employees also face some challenges in engaging in this system. The system could create competition for helpers and initially helpers currently employed through informal social networks, might lose their existing jobs to their *better* counterparts, once the system is deployed. Currently because of the small scale of the pilot project, such situations have not yet arisen. Till date 5 out of the 45 people in the worker pool have been placed with employers through the pilot project.

For employers to engage:

There are several challenges for employers to engage in this system. First, for employers, as compared to employees there are fewer incentives to participate in this system. There are some incentives to use the application to find a helper if you do not have an extensive social network and have just moved to a city. Also, depending on the occupation of the employer, this application can result in time savings in terms of finding an employee. There are fewer incentives, however, if the individual employer already has an existing social network, prior contacts and wants to maintain a suppressed wage because the labor relationship is informal. With formalization, employers may feel more accountable, forced to pay higher wages, and may find it more difficult to exploit workers.

The responses to engage in the pilot project from employers have been slow but steady. Most employers who have called to participate said that the service seems useful. There have been calls not just from the apartment complexes where the pamphlets were distributed but also from friends and relatives of these people living elsewhere in the city. The reactions to the two schemes have been mixed. Recent interviews with employers revealed that some employers were not willing to enter into an agreement that could make them liable to questions regarding their labor practices from the intermediary organization. They were worried that in the new system, if a helper launched a complaint against an employer, it was likely that the intermediary organization would support the helper and question the employer. These employers expressed that in such a situation they would prefer their informal social network to find a helper. Employers with such sentiments tended to choose Scheme I or did not use this service. However at the same time, a number of employers have participated in scheme 2. There have been a total of 30 calls from employers so far in the pilot project.

Other challenges:

One of the challenges for the project is to standardize wages under scheme 2. Again setting standard clauses and at the same time catering to various employer requirements remains a challenge. Most employers felt that the intermediary organization should in addition to making helpers aware of their own rights, also instill in them a sense of responsibility and commitment. Employers we interviewed indicated that in an unforeseen case of theft by the helper at the employee's house, the intermediary organization within the new system is likely to face the repercussions. The employers would also want the intermediary organization to find a helper located close to their residence. The reason was so that employers could contact and find the helper if she missed a day's work without prior arrangements with the employer. In a localized system that would be possible, but when the system is scaled up this issue of finding helpers close to employers' homes will have to be dealt with by the intermediary organization. This may prove difficult if the intermediary is a small NGO with limited capacity.

Since the beginning of the pilot project, there have been calls from different parts of the city requesting the service. Currently the NGO hosting the service is not equipped to provide helpers to all neighborhoods in Bangalore. Not many helpers are willing to travel big distances for work

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without getting travel allowance, since many employers are not willing to pay travel allowance. Gradually the NGO will collaborate with other NGOs working in other slums in the city to increase the size of the worker pool and to be able to connect helpers to employers living in other parts of the city.

In all the placements that have been done, the employers have paid a fee for the service. The cash flow is low currently, but as the scale of the project increases, the hope is to increase this cash flow.

As has been mentioned earlier, we envision the final application to be a web-based application with a database backend. Through the web-based application, employers will specify their requirements from their PCs. This information will get stored in a database and domestic helpers will be able to see the same information at community kiosks in a Text-Free form of UI.
Transitioning from a low-tech service into a technical service appears to be a challenging task. More than the technical set-up, the difficult part would be deciding physical locations for setting up the text-free UI at community kiosks. The plan is to set-up the kiosks at the NGO office where the physical infrastructure such as electricity and connectivity is conducive for setting up the system.

8. CONCLUSIONS

This paper has shown that social constraints, such as low levels of education and literacy rates, can make it difficult for certain populations to access the benefits of ICTs. We proposed an application to address this constraint with a text UI design for the illiterate population to access labor market information. The preliminary results from user testing indicated that semi-literate and illiterate individuals without prior computer skills could successfully navigate and access employment information through this UI.

Evidently there are social and economic challenges for both employers and employees to engage in this new system. We recognize that this technological application is one aspect of a much larger challenge to address the informal domestic labor market and that the technological solution is not necessarily the first step in this process. As the low-tech pilot project is implemented we hope to better understand whether and where this technological application may add value to a more formalized system.

However, despite these challenges, results of usability tests show that the application generated positive interest among the illiterate communities. The current low-tech service also demonstrates there are several benefits that employers could gain from using such a system. The design principles behind this text free UI holds broader relevance to a number of other domain (such as agriculture and health) and applications in the field of ICT and development.

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