

# ICTs for Employability in India

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## ABSTRACT

30% of Indian IT graduates are considered employable in the IT sector, and only 10% of Indian professionals with any kind of degree are employable in multinational companies in India. Employability is a problem in India stemming from insufficient vocational and skills training, and difficulty in obtaining employment. With the recent National Skills Development Policy prescribing greater web-based learning, Information and Communication Technology (ICT) can be an enabler for employability services.

Sampling ICT usage in employability programs and services, this paper serves as a manual of sorts for entrepreneurs and employability program designers in identifying ways in which ICTs can be used by corporations and NGOs involved in employability. E-learning, mobile-learning, basic audio-visuals and telecentres provide a means for skills training. Training organizations also use IT for office processes and fundraising. Online job portals, mobile job services, freelancing platforms and social networks are some of the ICTs that help in finding employment.

## Author Keywords

Employability, skills training, vocational training, e-learning, m-learning, online job search

## INTRODUCTION

Employability is the ability to gain and retain fulfilling work. The most widely accepted definition of employability is a person's capability of gaining initial employment, maintaining employment, and obtaining new employment if required [1]. For individuals, employability depends on their assets in terms of the knowledge, skills and attitudes they possess; the way they use and deploy those assets; the way they present them to employers; and the context (e.g. personal circumstances and labor market environment) within which they seek work [1]. In simplified terms,

employability can thus be categorized as gaining skills (assets), and obtaining employment (context).

India has the second largest pool of human resources in the world. With one of the youngest populations in the world, a low dependency ratio (ratio of those not in the labor force to those in the labor force) and a surplus workforce, India has a strong comparative advantage over most major economies, and this has been one of the primary factors for the projection of great economic growth for India [2]. While the world is expected to encounter a shortage of 47 million working people by 2020, India will have a surplus of 56 million working people [3]. By some estimates, in two years, 25% of the world's workers will be Indian [4]. However, in order to utilize this demographic dividend effectively, India needs to impart adequate and appropriate skills to its workforce.

A socio-economic analysis of unemployment in India using 1999-2000 National Sample Survey Organization data reveals that unemployment was the highest in the age group of 20-24 years, with at least 83% of the unemployed belonging to the age group of 15-29 years both in rural and urban areas [5]. Only 5% of the Indian labor force in the age category of 20-24 has vocational skills obtained through formal training whereas the percentage in industrialized countries is much higher, varying between 60% and 80% [6]. Further, worryingly, the proportion of unemployed was found to be rising with the increasing level of education and it was highest for the category 'graduate and above' both in rural and urban areas [5]. The Economist Intelligence Unit, NASSCOM and McKinsey & Co. report that currently only 30% of Indian IT graduates are actually deemed employable in the IT sector, the spiraling impact of which has been predicted as the shortfall of 500,000 professionals for the sector by 2010. Only 25% of the engineering graduates, 15% of finance and accounting professionals and 10% of professionals with any kind of degree are suitable to be employed in multinational companies in India. Further, India also lacks management talent with a mere 23% employable talent existing in the country [4]. In urban areas, only about 19.6% of male and 11.2% of female workers possessed marketable skills. The rural areas fare even worse with only 10% of male and 6.3% of female workers possessing marketable skills [6]. So much so that companies are now resorting to employability tests such as the recently developed AMCAT

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(Aspiring Minds Computer Adaptive Test) to screen candidates [7].

Low marketability of skills, insufficient training opportunities and the gap between labor market size and employable labor have created a mismatch between industry labor requirements and trained available labor, leading to unemployment. Thus, employability is undoubtedly a major problem facing the workforce of India. The Government of India recognizes this and has been actively pursuing some initiatives since 2007, such as short-term modular employable schemes and the upgradation of its 1,396 Industrial Training Institutes (ITI) through public private partnerships. In association with the International Labour Organization (ILO), the Ministry of Labour and Employment recently put forth the National Skills Development Policy (NSDP), which sets forth the goal of achieving 500 million skilled people in the country by 2022 [6][3]. The government's initiatives are in the right vein but are far from enough. Private and academics measures are needed to address employability as well.

Among several guidelines, the NSDP outlines expanding e-learning and distance learning: "Enlarge the scope of the 'Skill Development Centre' programme into a 'Virtual Skill Development Resource Network' for web-based learning" [3]. Information and Communication Technology, or ICT, is a provenly valuable tool for education, and socio-economic development in general. ICTs can therefore play a significant role in enhancing employability initiatives. [6] makes the case for ICTs for employability claiming that "the future seems very promising for ICT applications in employability skills sector given the projections for employability programmes by government as well as non-government organizations" by citing advantages in cost effectiveness, reach and scalability. This paper categorizes the landscape of how ICTs are currently being used for employability in India.

#### **RELATED WORK**

Several reports and studies, some of which are works in progress, have been funded by the government, private institutes, the World Bank, and the International Labour Organization to study the unemployment and employability problem for youth in India, and to make recommendations for policy and structural reform, often informed by measures in other countries: [4], [8], [9], [10] and [11]. [3] analyzes the current technical training infrastructure and the National Skills Development Policy. [12] is a market research of the vocational training industry in India. [6] samples some of the current skills training initiatives for underprivileged youth to make training program structure recommendations. Some of the unanimous suggestions from these reports are for greater collaboration between industry and academic institutions through Public-Private Partnerships and for curriculum development; accreditation of vocational training for quality control; short-duration courses (less than a year); greater training infrastructure in states of the country with few or no ITIs; and more focus on

communicative English, basic management and personality development skills (soft skills).

[6] has a section that provides a short consideration of how ICTs are used in the 39 training programs they surveyed, categorizing the type of computer or internet technology used in 5 phases: pre-class room, class room, evaluation, placement, and post-placement. Apart from a couple of examples, and a case study of an Australian youth training organization, the report doesn't dwell in detail into the different ways ICTs are and can be used for employability. The Information Technologies and International Development (ITID) journal recently released a special issue on "ICT Skills and Employability" [14]. The issue focused on models and policy for ICT and computer education in developing communities, and the developmental, economic and employment impact of ICT education.

This body of work stands independent and unique in several ways. This an investigation of some of the ways ICTs are currently being used for employability in India. The purpose of this is to serve as a manual of sorts for entrepreneurs, employability program designers and the like to identify ways in which ICTs can be used for corporations and NGOs involved in employability. A secondary goal in providing readers a snapshot of existing efforts, and thereby hinting on insufficient or missing efforts, is to help spark research initiatives. This paper differs from [14] in that it doesn't focus on ICT education, but rather considers ICTs as a means or a medium for employability, such as using computers as a means for learning how to wire circuits for electricians. It does draw some parallels to regular education though when expanding on vocation training, to elucidate arguments. Also, in abiding by the holistic definition of employability as stated in the beginning of the paper, it differs from all aforementioned work in focusing not only on skills training (assets in employability), but also on obtaining employment (context in employability). This paper is restricted geographically to India with limited examples from other countries.

#### **METHODOLOGY**

The methodology for this study was to first identify various skills training and employability programs or services in India over the course of the year 2009, primarily through the web. This was complemented by a literature review of relevant efforts in journals such as ICTD (International Conference on Information and Communication Technologies and Development), CHI (Conference on Human Factors in Computing Systems) and ITID (Information Technologies and International Development), Indian newspapers and some economic magazines. The organizations identified included hundreds of NGOs, universities, corporations and technical institutes. A representative sample of these were researched in detail to compare the skills they impart, their philosophy or theory of change, the population type they serve, the industries or sectors they address, their funding models, the ICTs they

use and the like. In line with the eventual focus of this paper, the usage of ICTs were categorized based on their recurrence in different programs, and some programs were selected to elucidate the categorization.

The usage of ICTs for employability in India can clearly be classified into use in skills or vocational training programs; and in finding jobs, thus mirroring different aspects of employability. Within skills training programs, ICTs provide for e-learning, mobile learning, telecentres, audio-visuals, and platforms for funding. In obtaining a job, they provide for job portals, mobile job services, freelancing platforms and social networking. Some of the sub-sections in this classification might overlap such as E-learning with nearly all other skills training program sub-sections, but they have been separated primarily for readability and ease in understanding.

### ICTS IN SKILLS TRAINING PROGRAMS

With 57% of India's youth suffering from skill deprivation [4], the vast landscape of employability initiatives in India are vocational schools or skills training centers. Demand for skilled workers across sectors ranging from manufacturing to retail and hospitality is fueling the market for vocational training institutes. Sustained economic growth, rising trade and burgeoning domestic demand is driving the need for workers with necessary skills. The vocational training market in India is worth approximately 1.6 billion US dollars in 2009 and is estimated to be growing at 25% per annum [12]. English language training is the largest segment followed by Financial Services, Retail and IT [12]. Some of these are focused on students with no work experience, some of them on employees for continuing education, and some of them on the marginalized with not much exposure to education.

### E-learning

Several vocational training programs in India are set up around e-learning, and this is an increasing market trend. E-learning refers primarily to online or Web-based learning. E-learning as a field in itself has included methods like Computer-based Learning (CBL), Computer-based Training, Computer-supported Collaborative Learning (CSCL), and Technology Enhanced Learning (TEL); and technologies to support them such as Learning Management Systems (LMS), Learning Content Management Systems (LCMS), Computer-Aided Assessment, and Electronic Performance Support Systems (EPSS) [15]. While detail around this is out of scope of this paper, a simple classification of worldwide e-learning systems is as follows: knowledge databases (sites offering indexed explanations and guidance for questions, with search functionality), online support (forums, chat rooms, online bulletin boards, e-mail, or live instant-messaging support), asynchronous training (CD-ROM or web based training that is most often self-paced), and synchronous training (live instructor facilitates training via the web) [16].

The form of e-learning most prevalent in India is asynchronous training. Enterprises that provide online

course modules or courseware, many with some form of accreditation, certification or course credit, are abundant. Most of these are focused on engineering, information technology, management certification and language learning. A parallel to MIT's OpenCourseWare, Berkeley's Webcast or CMU's Online Learning Initiative, is the National Programme on Technology-Enhanced Learning (NPTEL) in India which came out of deliberations between Indian Institute of Technology (IIT), Indian Institute of Management (IIM) and Carnegie Mellon University [17]. Currently being run by seven IITs and the Indian Institute of Science (IISc) Bangalore, the main objective of the NPTEL program is to enhance the quality of engineering education in the country by developing curriculum based video and web courses. So far, supplementary content for 129 web courses in engineering, sciences and humanities have been developed that each cover 40 or more lecture hours, with 110 of the courses in video format. Contents for the courses were based on the model curriculum suggested by All India Council for Technical Education (AICTE) and the syllabi of major affiliating universities in India.



Figure 1. NPTEL YouTube Channel

Individuals can access the lectures for free via YouTube, or request for DVD versions (for just the cost of a blank DVD) in case of lower bandwidth or no internet connectivity. NPTEL reported 70,000 students in mid-2008 and YouTube indicates 1.72 million views of the NPTEL channel stream as of December 2009 [18][19]. The video courses are also broadcast on the television network DD Eklavya regularly [19]. Similarly institutions can get all the courseware from NPTEL by simply paying for the external hard disk drive that will store the content. Beyond this, they are responsible for investing in streaming set-ups at their respective institutions. Expansion plans for NPTEL include more content, involving more teachers across the country, workshops, discussion boards, and integrating content with worldwide courseware initiatives. A more experimental proposal by NPTEL to set up open virtual laboratories for engineering, modeled around MIT iLabs, was put down by

the Ministry of Human Resource Development for its price tag of above 10 million US dollars.

Apart from asynchronous training, some knowledge databases and online support is budding in the Indian context. Traditional knowledge databases or digital libraries run by academic institutions and the government exist for vocational information in domains such as agriculture and health. However, with more dynamic knowledge networks and databases such as Wikipedia proving successful, similar initiatives are coming up in India. For instance, Agropedia that launched in January 2009 provides an open access portal with a wiki, blog, forum and online chat for agricultural advice. It is run by seven agricultural research institutions (ICRISAT, IIT Kanpur, IIT Bombay, GBPUAT Pantnagar, UAS Dharwad, IIITM Kerala and NAARM Hyderabad). Backed by the Government of India and sponsored by the World Bank, it eventually aims to use weekly alerts from scientists on different crops to send text messages to farmers across India [20][21]. Similarly, almost All Questions answered (aAQUA) is a problem-solving system run by Agricom dedicated to finding solutions to problems posed by Indian farmers. Similar to the once Google Answers, the agriculture-focused aAQUA differs in that it is free, answers are guaranteed to be provided within 48 hours, and more importantly it provides support for a local searchable cache of the aAQUA repository on any computer that can be used when offline, and that automatically synchs/updates when online. aAQUA currently has 10,700 members with around 25,000 posts [22]



Figure 2. aAQUA Agriculture Q&A service

Knowledge networks are often richer in content and more scalable as Web 2.0 innovations which have highly user-

generated content, along with light community or social networking capabilities, such as Google Knol, Squidoo, eHow, HubPages, Mahalo, Epinions etc. Some initiatives around this are taking flight in India as well such as the people-powered community intelligence platform Kreeo which is organized around "Bodies of Knowledge" - users organize specific bodies of knowledge around any concept they see fit in a collective manner [23]. TooStep, taglined "Discover and share your professional expertise", is an Indian network of middle and senior level professionals that help each other in enhancing their careers by pooling and sharing resources, and getting access to relevant knowledge across industries [24]. PharmaExpress.net is a similar knowledge network for pharmacy, pharmaceuticals and healthcare related professionals; and BharatStudent.com, a social network for students, provides a "Knowledge Base" for test preparation.

Skills e-learning courseware for corporations, or enterprise e-learning, is also rapidly developing in India. Considering that most companies in India engage in significant training of new recruits, an outcome of the employability problem, this shouldn't be surprising. Enterprise e-learning primarily encompasses software training, sales training, compliance training, customer service skills, communication and negotiation skills. GurukulOnline Learning Solutions (GOLS) which claims to be the pioneer of e-learning in India is an e-learning content and services company with a large library of India specific off-the-shelf courseware in several industry verticals, patented technologies, and a portfolio of several big clients [25]. Similarly Mindlogicx, provides software for intelligent assessment systems (Vedas) and knowledge networks (K. Net) for vocational training [74].

With a strong culture of coaching classes in India, the thriving market of private tuitions and entrance test preparations is worth 6.8 billion US dollars in 2008 [12]. It is therefore no surprise that there is an increasing demand in online tutoring and coaching setups [12]. Examples of online services in India are the National Institute of Information Technologies' (NIIT) eGuruCool [26], and Educomp/Network18's Topper Integrated Learning System [27]. However, as mentioned earlier, online tutoring and synchronous training as an e-learning model for vocational training has not been explored in India, but there are indications of demand and potential for entry [13]. To this effect, online platforms such as WiZiQ which allows teachers to make online tutoring businesses could be created for India as well [28].

### Audio-Visuals, and Franchise Educations

The e-learning examples mentioned so far do not cater to marginalized people, especially those in rural areas. However, a hub and spoke and franchising model is increasingly developing to distribute asynchronous training across the country. Innovation in technology for education and skills training for rural areas is most often around distribution. For instance, several approaches make use of

digital storage media (such as DVDs, flash memory devices, or hard disks) transported by the postal system, forming a general digital communication mechanism, termed "Postmanet" [29]. Basic ICT such as audio and video recordings are in use by vocational training programs in the form of audio and video tapes. Most of them are organized as distance learning schools with tapes for group instruction. A study in progress by the QUEST Alliance reveals that 48% of the vocational training organizations they studied used audio-visual aids in the classroom [6]. Audio-visuals provide the simplest technology to reach out to people in remote areas, especially since radios, music players and televisions are more widespread than computers in rural areas.

An example of a recently successful initiative around digital video distribution for agricultural skills training (agricultural extension) to small and marginal farmers is Digital Green, a project that grew out of Microsoft Research India [30]. Digital Green has content producers, teachers and local farmers create videos for training, which are stored in a local online video database. These videos are then provided to mediators in villages (DVD are mailed out). These mediators play the movies on a shared television in villages regularly for farmers to view in group settings. In this way, local social networks are tapped to connect farmers with experts; the thrill of appearing "on TV" motivates farmers; and homophily is exploited to minimize the distance between teacher and learner. In a trial involving 16 villages, Digital Green was seen to increase adoption of certain agriculture practices by a factor of at least five times over classical agriculture extension. The hardware investment was a TV and a DVD-player per village, and one digital camera and PC shared among all 16 villages. [30].



267 object(s) satisfy the search criteria.  
displaying matches 21 - 30.

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 01/12/08	<p><a href="#">Brinjal Interculture Operation in Rengalbeda, Orissa</a></p> <p>This film shows how to make bunds and how to interculture with brinjal. Oriya language. (Seasonality: Kharif and Rabi)</p> <p><i>practicals: agriculture, language: Oriya, 102MB, 00:06:53, alias: pradanbrinjal1, from: jashipurfam.</i></p>	  Debendra/Ranjon
 01/12/08	<p><a href="#">Tomato Nursery Bed Preparation in Birsoroda, Erki, Jharkhand</a></p> <p>This video demonstrates the procedures for preparing a nursery bed for tomato cultivation. The nursery bed provides better growth for tomato seedlings during the Kharif season. It shows the technical aspects of bed preparation as well as its utility for farmers who are trying the technique for the very first time.</p> <p><i>practicals: agriculture, language: Mundari, 145MB,</i></p>	  Kalyan Munda/Daud Mundi

Figure 3. Digital Green agriculture extension video community Database

Digital StudyHall (DSH) is a middle school education research model that pioneered the distribution mechanism that Digital Green now employs. It uses a technical approach that it describes as the educational equivalent of "Netflix + YouTube + Kazaa" [31]. Digital camcorders are used by grassroots teachers to record content, the tapes are then funneled to a nearby hub for digitizing and uploading to a large distributed database, these are then distributed on DVDs to poor rural and slum schools who use shared TVs and DVDs to view the educational content. Once again, harvesting community participation in video generation proves to be a great motivator for teachers and also ensures community relevance. DSH is designed to work as a decentralized network of hubs and spokes. Each hub is a center of education excellence and the hubs themselves "talk" to each other. The spokes are typically the poor rural and urban slum schools that lack good teachers, good content, and other resources. Each hub works on highly contextualized content production (such as in the local language), content dissemination in its neighborhood, teacher training, monitoring, evaluation, and interacting and sharing with other hubs. A live deployment of DSH has been operating in India since 2005 with hubs in Lucknow, Calcutta, Pune, and Dhaka, covering approximately 30 schools and generating over 3000 videos in language, math, science, social science and other training [31].

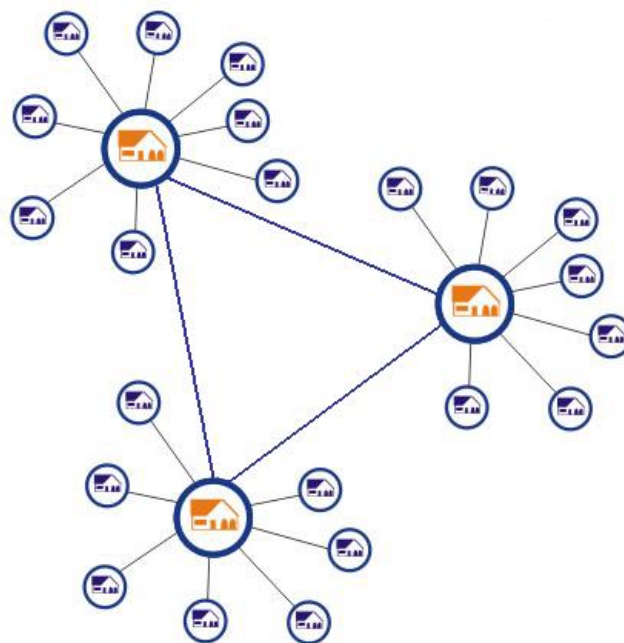


Figure 4. Hub-and-spoke model for educational franchises

In elementary education, an instance of this is popularized by Career Launcher Education Foundation (CLEF) for Bottom of the Pyramid (BoP) education [25]. CLEF runs K-12 Indus World Schools' (IWS) in big cities that each act as hubs to support 50-100 micro 'neighborhood' schools in the adjoining rural districts. Just like Digital StudyHall, the hub school is the source of all academic support and services required at the BoP school such as teacher-training,

curriculum-design and contextualization, audits etc. CLEF identifies and trains local entrepreneurs to take ownership of the running of the BoP schools. These entrepreneurs run the school on a salary generated from the school fees itself (after deducting running expenses). The community provides ancillary services such as mid-day meals and uniforms [25]. A visit to a CLEF BoP school outside Hyderabad in December 2008 by the author of this paper validated sharing of resources by the hub school in terms of a good collection of books at the BoP school, and usage of audio-visuals for fun learning. In fact, one of the only identifiable risks to that BoP school appeared to be regional politics.

Franchising models supported by asynchronous e-learning are also seeing success in vocational training. eJeevika HR Pvt. Ltd is a recent enterprise incubated under Indian Institute of Technology-Madras' Rural Technology Business Incubator, aiming to bring vocational training and job placement to rural areas [32]. It has set up 20 franchises in Tamil Nadu, and has placed 100 candidates in retail and security service firms over the year [33]. eJeevika identifies entrepreneurs through village council heads, non-profits and self-help groups(SHGs) to run a franchise. A franchise requires one to invest around 1,100 US dollars on a couple of personal computers, a broadband connection and power backup. Franchises then identify potential candidates who are trained by Ejeevika as per clients' requirements: students who wish to be trained register with eJeevika's website after which the company conducts an online interview in the presence of its client. Once the client gives a go-ahead sign, the candidate pays a fee and undergoes online training which is primarily asynchronous in nature and heavily relies on daily practice tests. Towards the end, the candidate then has to clear online tests, interviews, and a final face-to-face interview with the client. Students pay a nominal fee of 11 US dollars for enrolling in the program. In this way, Ejeevika plans to train and find jobs for 200,000 people in the next couple of years through a network of around 1,000 franchisees in the rural districts of India [6].

Another franchising model is being pursued by GYAN, a recent initiative out of Northwestern University, to provide vocational English and basic computer training skills to employable rural youth. As a for-profit microfranchisor, GYAN sources and trains local, high-potential entrepreneurs/franchisees in rural villages to run vocational English centers. Qualified teachers are also recruited from that community to supplement their income by training selected students in commercial English. Students are to be charged 30 US dollars to undergo 120 hours of training, and tested and awarded GYAN certification that demonstrates their skills and employability. GYAN is currently working with major service organizations to ensure that a GYAN certificate is accepted and branded as evidence of the recipient's requisite skills for a broad range of entry-level jobs [34]. While GYAN is currently in a seeding phase, the franchising model using e-learning promises to be sustainable (as opposed to non-profit functions) and is poised for further growth. Also, audio-visuals are a simple but provenly sound distribution mechanism for distance learning.

### Mobile Learning

Just as postal video distribution mechanisms help to reach out to rural areas, cell phones serve as an increasingly promising medium to reach out to low-income people in India. With 488.4 million active mobile phone connections in India as of October 2009 [35], increasing cell penetration in rural areas, and phones as cheap as 20 US dollars, there is an opportunity for skills training value-added services. Mobile phones have become a significant focus in ICTD (Information and Communication Technologies and/or Development) research and applications [36]. Mobile learning can be very valuable for "just in time" education. Majority of workers have jobs that take them away from a brick and mortar office – for example, salesmen, consultants and service personnel. Training here can benefit from instruction provided at the job site. Further, in rural areas, the nature of work provides for periods of wait such as in herding or in agriculture that can be used for skills learning through cell phones. It is no wonder that mobile learning, or m-learning, is on the rise and holds potential. In so-called developed countries m-learning is primarily via podcasts, mobile TV or applications for rich-interaction via phones such as the iphone. In India, SMS (Short Messaging Service), low-bandwidth educational software, and some speech-to-text functions serve to be the primary means for m-learning. The market for mobile-learning in Asia is slated to be much bigger than North America [37]. Some of the companies in India focused on m-learning content and technology development are EnableM Technologies Pvt Ltd., Tata Interactive Systems, BlueApple, ZMQ Software Systems, Navomedia, and OnMobile Global Ltd.

English education has been one of the primary domains served via m-learning. For instance, BSNL Mobile launched the "Learn English" program to teach spoken English through simple stories and everyday situations that

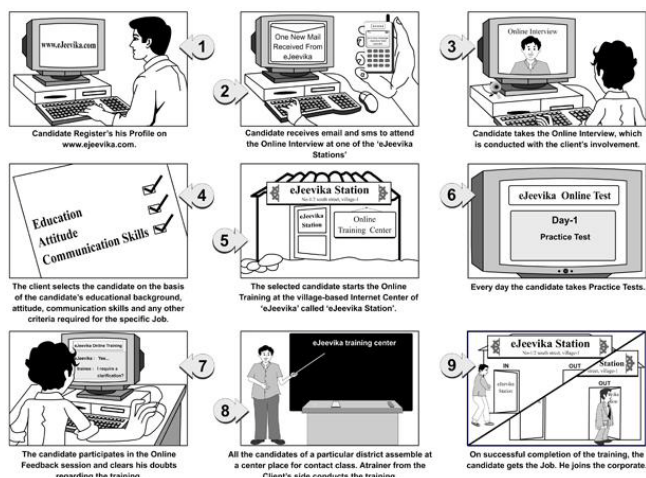


Figure 5. eJeevika training process flow

the common person can relate to. Subscribers have the option to select their level of learning based on their proficiency of the language, and also select specific professions, situations or conversations. So, a driver or a receptionist can listen to lessons aligned to his or her profession, and also listen to other conversations based on situations they might encounter everyday. Daily SMSs and practice tests are a part of the learning package. To make the program usable and self-paced, certain options such as bookmarks and pausing are now being introduced. The program supports nine Indian languages, and costs 50 cents (US dollars) per month and a nominal call browsing charge of 0.6 cents (US dollars) per minute. A feedback survey indicated that 70-80% of the users found the service very relevant, demanding for more content [38].

Similarly, in the neighboring country of Bangladesh, the British Broadcasting Corporation (BBC) launched the "BBC Janala" service in November 2009 by partnering up with all the mobile operators in the country to offer a universal service to teach English to millions at half the price of a typical IVR call or SMS. It offers over 250 audio lessons and SMS quizzes and is organized into three levels of ability: 'Essential English', 'Pronunciation', and 'How to tell a story'. Mobile lessons are supported by the website [bbcjanala.com](http://bbcjanala.com), where a virtual community accesses learning content for free, uploads their profiles and interacts with other learners in Bangladesh and around the world. Audio and video content is also shared on popular websites like Facebook and eventually YouTube. BBC Janala plans to work alongside recently launched youth television program BBC Buzz, providing weekly lessons on mobiles related to Rinku's World, an animation series on the show building learners' confidence and tackling common mistakes in English [39]. Such an educational blend model is common for m-learning, and is also being explored by other in the media sector, such as possibly Sesame Street in India. Another trend gaining traction in e-learning and m-learning is skills training via games. There are handful mobile educational games in India, such as research efforts by MILLEE (Mobile and Immersive Learning for Literacy in Emerging Economies) that uses traditional village games to model mobile games for English education in rural Indian primary schools. Through a partnership between Nokia and Carnegie Mellon University, cell phones with these games are going to be provided to 400 students this year [40].

There are m-learning training applications beyond English learning. Indira Gandhi National Open University (IGNOU) partnered with Ericson to provide educational content to their IT students via text, audio, and video on mobile phones (3G applications). They are also contemplating examinations on cell phones, and recently decided to impart students capsule courses on dance, music, art, public health and other subjects via mobile phones as well [41]. Cellphones are now also coming pre-loaded with training applications. For example, the Spice M-6060 cellphone

comes with "Spice Masterji", a pre-embedded application that helps students prepare for CAT, AIEEE, GMAT, CBSE Board examinations by practicing on test papers - a step beyond general vocabulary applications on most phones [42]. EnableM Technologies also created Study Buddy, a student mobi-Community application to enable students to remain connected with study groups while on the go, and take quick mock tests; it also developed LILA, an intelligent self-tutoring system to impart basic functional knowledge and grammar of Hindi, and communicate in simple day-to-day situations [43].



Figure 6. LILA – an M-learning application to learn Hindi through English

Yet another set of mobile applications for employability, are around information access for particular professions, or specialized knowledge databases accessible via cell phones. Different from general information look-up application for regular mobile subscribers, are efforts such as Healthline, a research initiative in the neighboring country of Pakistan, that provides community health workers access to reliable health information via cellphones [72]. Healthline digitizes relevant texts and uses speech functions to allow health workers seeking information to call any time, toll-free, from any cell phone or landline, and use their native language to navigate health texts. There are several other mobile services that enable people to do their jobs better, that is out of scope of this paper [36].

Mobile learning has spun out of e-learning to become a discipline on its own with recognizable professional organizations and research conferences. This is a significant potential growth sector in technology for vocational training in India, with several initiatives in the pipeline.

#### Telecentres, and Basic Computer Education

E-learning for vocational training assumes access to ICTs and basic ICT literacy. While some of the skills training is through structured schools or institutes that provide access to computing resources and the required facilitation, and some programs are via mobile phones owned by people, there are several ad-hoc web services that hence require access to internet-enabled computers. Apart from those Indians who can afford to own personal computers, low-

income people need access to them in a way that they can use them for learning. This section is not about ICT education, which as mentioned earlier is not the focus of the paper, but is about some of the ways low-income people can access computers, primarily for the goal of employability.

Computer access for low-income people in India is primarily through telecentres, or internet kiosks. With hundreds of thousands of telecentres already in India, they are growing rapidly via efforts such as Drishtee, Department of IT's Common Service Centers (CSC) and Community Information Centers (CIC), Grameen Gyan Abhiyan's Village Knowledge Centers (VKC), Indian Space Research Organization's Village Resource Centers (VRC), NASSCOM's Knowledge Networks (NKN), Government of Karnataka/Comat Technologies' Rural Business Centers (RBC) or Nemmadi, Chiraag by n-Logue etc., and they promise for covering all rural areas. Categorizing the telecentre movement is out of the scope of this paper. However, just setting up telecentres without targeted application has been known to not have much development impact, with usage eventually getting concentrated to community members who are not particularly disadvantaged [44].

Yet, telecentres can provide a great channel for reaching out to the marginalized for computer and vocational skills training, with advantages over self-learning approaches such as occasional scaffolding by telecentre operators - mediation is often desirable in ICTs for education. To this effect, there are some telecentres providing vocational training courses. For instance, Drishtee has set up a software curriculum development institute called the Centre For Education & Entrepreneurship Programme (CEEP) that provides diplomas for vocational training courses through its kiosks, and is financially sustainable [45]. Similarly, the Indira Gandhi National Open University (IGNOU), recently started a vocational training program with CSCs in Meghalaya for training on electrical wiring, and some computer training [46]. Akshaya project is an initiative by the State of Kerala to setup telecentres, or as they call them e-centres, to impart basic computer and IT skills, and make constituents e-literate. It has already seen success in having two rural districts become the first 100% e-literate districts in India. They also claim to be using e-learning programs like Intel learning, Learn English, Arabic Tutor, Internet for Mass, e-Vidhya etc., and are rolling out specific job-oriented courses developed by Department of Electronics and Accreditation of Computer Courses (DOEACC) and IGNOU [47]. Comat Technologies provides training for the Common Entrance Test (CET), and Cisco Certified Network Associate (CCNA) training through its RBCs [48]. With the large number of telecentre programs in the country, computer and vocational training can be adopted by many more.

There are also several e-inclusion initiatives to bring computer access to the marginalized. E-inclusion is a

domain on its own, and is not detailed in this paper. Yet, as an example, a recent project aiming to provide basic digital literacy and skills development to low-income workers is Kelsa+. Encouraged by "hole-in-the-wall" projects in India that allowed urban slum children free prolonged exploration of computers by leaving a computer in a slum neighborhood, Kelsa+ provides an Internet-connected PC for free unrestricted usage for the service staff of a Bangalore technology company office. The research over a year a half saw gains in worker confidence, self-esteem, and basic digital literacy, with a few individuals experiencing improvements in second-language (English) proficiency and exposure to career opportunities. This approach is deemed to be slightly better than telecentres without targeted application in allowing for unrestricted usage which leads to basic computer learning through exploration [44]. In general, if skills training goals are more closely incorporated with digital divide initiatives, we hypothesize greater employability impact.

### **Organization Processes and Fundraising**

So far we have detailed how ICT plays an integral role as a medium for skills training and in distribution of educational content. Yet, a significant aspect of information technology (IT), in the traditional sense of IT, is for increasing productivity in office related processes such as with ERP (Enterprise Resource Planning) and CRM (Customers Relationship Management) software technology. Vocational training institutes and programs, like any organization, need IT support for increasing productivity in their practice, such as for better governance and transparency [6]. This is a vast discipline in itself and will not be expanded in this paper.

However, a use of ICT in the space of vocational training, which is often composed of non-profits or NGOs (Non-government organizations) that are dependent on charitable contributions to thrive, is for fundraising. This is being highlighted because even though innovative private and PPP models are developing, currently most organizations that provide skills training to the marginalized are donation-dependent non-profits, since the marginalized cannot afford it otherwise. ICTs have seen application in fundraising worldwide through platforms for contributions or donations. These can also be social-networking based employing peer-to-peer donations or lending. Some examples are Network for Good, Mission Fish, Kiva, and Global Giving. In India, GiveIndia is such a platform with a special category for vocational training & employability programs. Browsing through GiveIndia brings up NGOs like Sampark and Child Survival India, eliciting online donations to support a child for vocational/livelihood training [49]. NGOs can get direct contribution via such a service, as opposed to setting up the infrastructure and handling or processing it themselves.

Another fund-raising technique used by specific vocational training schools, such as those for artisans, is to sell the products developed by students in the vocational training

schools online. For instance, Ladli provides vocational training to street children in Jaipur so that they can make jewelry and handicrafts such as bags, greetings cards, decorations and puppets, and sell it to earn a livelihood. It has set up an online store to sell these products [50]. A similar initiative that provides transparent e-commerce to artisans in Bihar is Drishtee [51]. Such products can find even more paying customers online if coupled with existing online social networks such as Facebook, and their charity gift provisions. Further, to reduce the cost for providing for a shopping system like Ladli does, Ebay Stores (MissionFish) could be leveraged. Indian NGOs can better employ social networking technologies to reach out to a young middle class for fundraising.



Figure 7. Ladli online store for jewellery and handicrafts



Figure 8. ICWFD courseware access card

Finally, technology can provide for fund-raising avenues through advertising. For instance, an NGO website could support banner advertising, but that may not ideal. A better example is the International Commission on Workforce Development (ICWFD) which has partnered with leading e-learning content providers to provide over 1500 high-quality courseware to the underprivileged at negligible costs, providing employability skills to over 1 million people worldwide. The courses can be taken from anywhere in the world through a PIN-based branded scratch card

system which lends itself well to sponsorships by companies, especially those with Corporate Social Responsibility (CSR) programs. Using the system, companies can easily show CSR in their local markets. In creative ways such as this, technology can provide a means for advertising revenue to NGOs, especially those undertaking vocational training, since companies are often a stakeholder in vocational training.

### ICTS IN FINDING JOBS

Imparting skills and leaving it at that is a task half done. Yet, several training programs do just that. A major function in employability is gaining employment, or finding a job. In today's world, ICTs have replaced employment offices and head hunters or recruiting agencies as the primary medium for finding jobs, and the same applies to India as well. ICTs in use for finding jobs can be categorized as job portals, freelancing platforms, mobile job services, and social networking for jobs.

#### Job Portals

Job portals are a crucial medium to find work. In USA, even blue collar workers use portals like Craigslist to find jobs. The big job portals worldwide such as Monster, CareerBuilder, and Craigslist, all have a strong presence in India as well. There are several indigenous job search portals, and JobSitesIndia.com providing a listing of them. Portals for the non-profit sector are idealist.org, and the indigenous barefootjobs.org and letmeknow.in. Indeed.com is trying to aggregate job listings in India like it does in other countries. There is no doubt that job portals are well in use for white collar jobs in India. However, usage on sites such as Craigslist in India indicates that these are not being used for labor and blue collar jobs.

20 Top Job Sites	
www.naukri.com	www.india.jobs.com
www.monsterindia.com	www.jobsahead.com
www.clickjobs.com	india.recruit.net
www.timesjobs.com	www.placementindia.com
www.jobstreet.com	www.jobcity.net
in.jobs.yahoo.com	www.careerindia.com
www.cybermediadice.com	www.careerbuilderindia.com
www.naukrihub.com	www.careerjet.co.in
www.bixee.com	www.naukri200.com
jobsearch.rediff.com	www.careerkhazana.com

Table 1. Top 20 Indian job sites as per Naukri Hub

Rajasthan Rozgar is an example of a job portal that does target rural workers. Run by the government of Rajasthan, it provides for job search and résumé provision functions not only on their website but also by just calling the multi-lingual job portal customer service [6]. While it may reach out to rural employees, employers use the portal to primarily seek out white collar jobs, thus rendering the

portal moot for blue collar jobs [52]. Research on creating a service to connect low-income domestic workers to middle class families in Bangalore reveals some of the challenges with computerized job search for blue collar workers and day laborers in India [53]. Some of these were around establishing trust or credibility, maintaining quality of service (quality control), reaching out to domestic workers who didn't even have phones, determining a pricing mechanism agreeable to both employers and employees, and conflict resolution between employers and employees. Similar challenges were faced by the author of this paper in exploring the provision of a similar service, called Choresforce, in the United States. The Bangalore project solicited an NGO in the community to handle most of these challenges in serving as a credible mediator that could also reach out to domestic workers. Such a model is obviously not very scalable though.

Babajobs.com is a start-up in Bangalore itself that learnt from the aforementioned research project and is now successfully brokering connections between families or employers, and workers [52]. It partners with agencies to collect identification documents of workers and create profiles for them. It then charges middle class families 22 US dollars to view the phone numbers of all domestic workers for 6 weeks online, and 70 US dollars for guaranteed recruitment or replacement for 2 months. The model seems to be working with over 320,000 jobs being already posted, 61,000 job seekers listed, and the company claiming to break even soon [54]. It has spread to several cities, and is gearing to use mobile phones for outreach to reach scale.



Figure 9. Babajob.com worker profile

Job portals are therefore proving successful in India, with scope for more in specialized industry verticals. New models for job search for urban poor are developing in a Craigslist-type geographical scaling fashion, but computerized job search is yet to be appropriately designed and implemented for rural areas.

### Mobile Job Services

Cell phones hold key for distribution to the masses in India as mentioned earlier. Using cell phones to provide updates on relevant job opportunities is therefore a natural application of phones, which holds significant potential. Not only does this provide reach to the rural and urban poor, but is also reduces the response time by making communication instant, thus allowing for a suite of just-in time job services to be provided that weren't ever possible. Technologies in use are IVR based systems, SMS based systems, basic interaction applications, and interaction rich applications.

Monster India, in catering to upper middle class white collar workers, recently launched a service to browse and apply for jobs using GPRS or SMS on phones such as the iPhone. They have also set up a mobile video resume system [55]. As indicated earlier, Babajob is resorting to a "Job on Mobile service" in Karnataka via Airtel, Reliance and IDEA to reach out to low income groups in several languages. By dialing a number, customers can select from a variety of job options to choose their desired salary range as well as preferred job locations from menus on the screen. They can update profiles, browse unlimited jobs for free, and unsubscribe by dialing the same multi-modal number. Users pay 22 cents (US dollars) for unlimited usage for 10 days [54]. Monster India and Babajob resort to using mobile services to complement their online job services and to link to their web database.

Apart from the potential for other job portals to leverage mobile job search, other types of mobile job services can develop in India that have proven to work in other developing countries. An example is Souktel, a Palestinian job matching service that is solely mobile based with no web interface [56]. The technology operates as follows:

- Through short SMS surveys, youth users create basic "mini-CVs". These include data on age, location, skills, education level, and career interests.
- At the same time, employers create simple SMS "job ads" through a similar SMS Q & A process.
- Both sets of data are sent directly from users' phones to a central database.
- Database matches youth "mini-CVs" with relevant "job ads"—pairing identical information from youth and employers.
- Users then receive "job-match" messages directly to their mobile phones—with details about job opportunities or potential staff, along with phone numbers for follow-up interviews. Users can also browse for jobs or staff from their phone handsets.

Another type of mobile service that could flourish in a fragmented online job portal market as in India could be an aggregator service that simply broadcasts updates on relevant job opportunities scraped from several sources to mobile phone users. A complete social franchiser model has

developed around mobile broadcast job search services called Mobile for Good (M4G) that has proven to be successful in Kenya via Kazi360, and is looking out for entrepreneurs to implement it elsewhere in the world in return for certain share in the revenue from the franchises [57] (Kazi360 is not an aggregator though, seeking out employers on its own).

For the vast population of only speech-literate people, a dial-in voice navigable job service is a viable option that is being considered by some [58]. Altogether, mobile job services are a largely untapped field in India, with some efforts in the pipeline.

### Freelancing Platforms

Nearly 50% of the Indian working population is self-employed [4]. Online portals can be used by freelancing micro-entrepreneurs or self-employed people to find work to do remotely. This is prevalent in several sectors worldwide, but especially in IT. India has established itself as a leader in outsourcing and back-office IT functions. Since online freelancing platforms are not geographically constrained, Indian programmers widely employ these platforms to find contracts. Freelancing platforms, especially those focused on IT, might provide more employment to Indians than any other nationality, and in turn make the low-cost benefits of outsourcing accessible to small and middle-sized companies in the so-called developed world.

Guru.com, which claims to be the largest online service marketplace for freelancers, has 52,500 Indian freelancers, majority of whom are in Programming & Databases, Websites & Ecommerce and Admin Support fields [59]. Similarly elance.com, an Ebay-type freelancing marketplace supporting bidding for available projects, has 14,200 Indian professionals registered with the majority in Web & Programming, and Admin Support fields [60]. Writing & Translation and Design & Multimedia are the next popular categories for Indian professionals. Both these platforms have some Indian freelancing firms making half a million to a million US dollars yearly solely through these platform [59][60].

Such platforms are review-based, hence serving as a measure for Indian freelancers to provide high quality of services to be competitive in the global marketplace the platforms reflect. Some other freelancing platforms are serebra.com, getafreelancer.com, gofreelance.com, contractedwork.com, freelanceuk.com, limeexchange.com, agentsolo.com, bizreef.com, authenticjobs.com, adveres.com, 99designs.com and allfreelancework.com. If that weren't sufficient there are Indian freelancing platforms such as FreelanceINDIA.com, IndiaFreelance.com, and allindiafreelancer.com, which however don't compare well to aforementioned freelancing platforms.

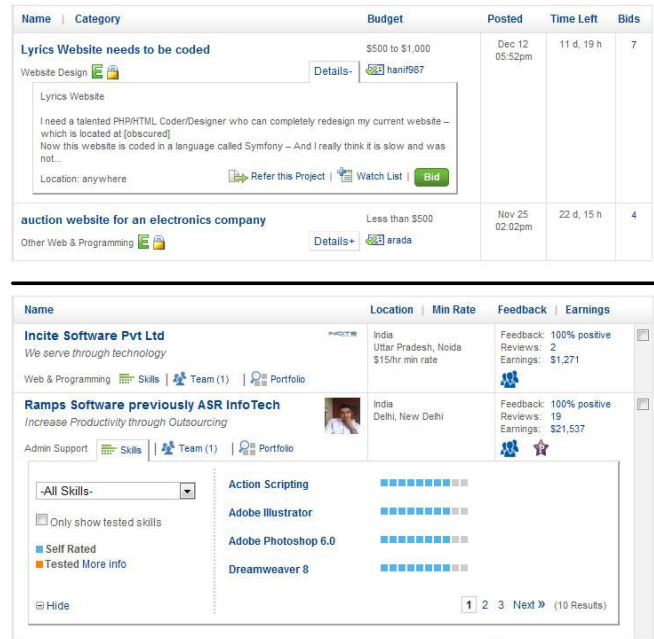


Figure 10. Elance.com – tasks and provider profiles

As indicated, freelancing platforms are primarily business process outsourcing platforms accessible to the common person. The entire business process outsourcing (BPO) industry, which has helped India's economy (11 billion US dollars annually) and brought it to global attention, is a direct phenomenon of progress in ICT [61]. The next frontier in BPO is rural BPO - bringing jobs to rural areas. For employees in rural areas this complements computer education providing for seasonal employment, and a force to prevent migration to cities [62]. To companies this ensures lower attrition and lower salaries since cities are becoming expensive and competitive. However, the training costs for high-quality output are restricting work to applications such as data entry [63]. Some other services provided by rural BPOs are medical transcription, list generation/lead generation and vernacular call-centers. Some of the pioneering rural BPO initiatives are GramIT by Byrraju Foundation, SourcePilani, Uday by Tata Chemicals, Sai Seva Solutions, Lason India, Datamation Consultants, Drishtee, RBCs/Nemmadi by Comat Technologies, and several others ranging from government initiatives to companies and public-private partnerships, which are categorized in [64]. NextWealth Entrepreneurs Pvt. Ltd has recently started providing resources to entrepreneurs to set up rural BPOs – the startup budget for setting up a rural BPO centre of 200-250 people capacity is about 110,000 US dollars [65].

Freelancing platforms thus provide a means for Indian professionals, especially those in IT, without a permanent job a means to secure temporary or contract-based employment. A question that begets is whether an online platform can provide for contractual or temporary employment for non-skilled workers. Rural BPO initiatives require significant skills training. Amazon's Mechanical

Turk provides something close to this but it requires at least computer literacy. Mechanical Turk (MTurk) is a crowdsourcing marketplace that enables computer programs to co-ordinate the use of human intelligence to perform tasks which computers are unable to do [66]. Requesters, are able to pose tasks known as HITs (Human Intelligence Tasks), such as choosing the best among several photographs of a storefront, writing product descriptions, or identifying performers on music CDs. Workers, called Providers, can browse among existing tasks and complete them for a monetary payment set by the Requester. With very low payment rates, Workers on MTurk have tended to be from developing countries. In fact, Indians constituted such a large number of Workers on MTurk that the Indian Rupee became the first currency in MTurk to be paid in apart from the US dollar in 2007 [67]. Yet MTurk requires access to a computer and the internet.

Just as e-learning is moving to m-learning and job portals are employing mobile notifications to reach low-income people, a crowdsourcing platform like Mechanical Turk needs to reach out to low-income people for tasks via cell phones. txteagle, a mobile phone-based system in Kenya that untethers these tasks from the PC and offers them to mobile phone users, serves to prove that this is feasible [73]. txteagle employs tasks that only use text and voice communication channels, such as local translation. Such crowd sourcing mobile services that provide for a source of supplementary income to rural and low income populations could be an ideal fit in India as well.

### Social Networking

An adage in seeking employment is to "network" and leverage one's network to find placements and interviews. It therefore proceeds logically that online social networking would rightfully find a place in developing professional networks to help one seek employment. LinkedIn provides such a network worldwide. In India, apart from LinkedIn several professional networks are budding such as SiliconIndia, PeerPower, ApnaCircle, wapr, iProbook, Toostep, Brijj and TooStep.

A form of social networking for jobs that is recently coming up is referral sites that provide people rewards for referrals for job openings. While Bohire and WiseStepp are some recent examples of these in North America, online referral sites have seen much more popularity in India. Considering that it is hard to find an employable person in India today, this makes for a value proposition. For instance, Zyoin, taglined "Next Generation Career Portal" aims to develop the leading recruiting marketplace in India supporting what they call "home-based recruiting", or freelance recruiting. It reports 100 referrals daily against 75-100 listed Jobs, with a total registered user base of more than 10,000 [68]. Some other popular job referral networking services in India are ReferEarns and YellowJobs.com. Yet, the industry is dabbling to find an appropriate model as Indian referral networks Reffster and TechTribe, with over half a million users, closed down this year [69]. Further, most of the jobs

on current referral networking portals are only in the IT sector.

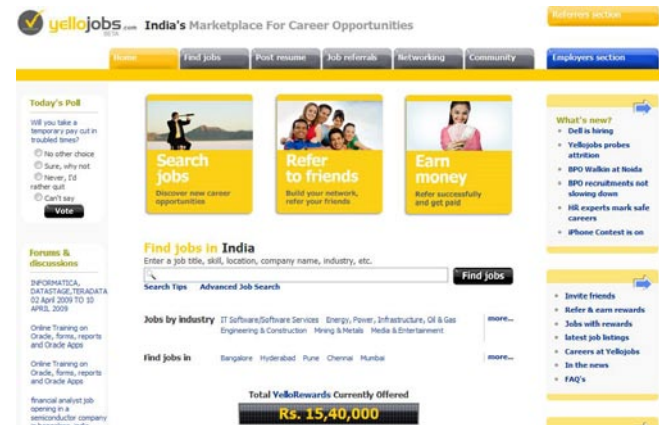


Figure 11. Yellowjobs.com – an Indian networking and job referral site

But in the Indian context, where over 90% of the workforce is in the unorganized or informal sector [70], and where employment has nearly solely been through word of mouth, it is expected that social networking technologies can play a greater role. Research in the unorganized sector of India show that online virtual communities could be a viable mechanism for organizing the workforce, such as laborers, to improve work efficiency and productivity [53][71]. Babalife.com is a social networking measure towards this. A service by the aforementioned job search portal Babajobs, Babalife is available through both the web and a SMS user interface in local languages so that low-income people can access it. Apart from regular social networking capability such as blogging and photo/video sharing, Babalife keeps users apprised if anyone they know posts a job or is looking for one. While Babalife usage hasn't significantly taken off and the company claims that they might have overestimated the value of word of mouth references and social networking, the tight coupling of Babalife and Babajob with focus primarily on Babajob could be a reason for this outcome. Further research on appropriate social network design and technologies for the poor is needed.

Altogether, online professional social networks are on the rise in India with scope for more or for better integration; and the new space of social networking technologies for the informal economy beckons positive results if a company can appropriately break in.

### CONCLUSION

With employability a severe problem in India, recent attention to change course provides for several financially and socially viable opportunities for existing corporations and NGOs, and entrepreneurs. ICTs serve as a critical medium for imparting training or obtaining jobs - hence any employability initiative should carefully plan their ICT strategy as core to what they provide.

In the training space for those who can easily access the web, synchronous training and online support setups are desired, and user-generated knowledge networks hold potential for growth. For those targeting the marginalized, basic audio-visual technology, telecentres and franchising options provide for tested ways to impart skills training. In the more crowded space of services to help people obtain jobs, there is a relatively untapped market in vertical job search engines. For those looking for greater impact in a particular community, setting up a rural BPO centre could directly provide for jobs to many. Further, ICTs such as donation portals and social networks can be used to raise funds for a non-profit effort.

Cell phones are becoming the most widely accessible ICT in India, hence providing a fortuitous medium for imparting language and other skills, and for finding job openings. The mobile market holds significant potential for any employability effort, if designed for appropriately.

As a freelancer, the web can be adequately used to get contracts from anywhere in the world, especially if you are an IT professional, and there are several social networking options to connect with professionals or even make money by referring some of your contacts.

Research is needed in social networking for the poor and for rural populations, since it holds great promise for vocational knowledge sharing and finding jobs in the informal sector. Similarly, mobile ICTs as a distributed work medium is a powerful concept that calls for more research.

This paper has provided a sampling of some of the current usage of ICT in employability programs and services, which can be used as pointers to further investigate areas of interest.

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