Mobile Phones in India
A Platform to Narrow the Digital Divide

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Executive Summary

This paper will argue that mobile phone applications are a key component of bridging the digital divide in India. It will explain how the digital divide is more than just access to technology, but about access to the knowledge and services that technology can provide. Lack of knowledge and services disproportionately affects the socioeconomically disadvantaged. This paper will explore how the proliferation of mobile phones makes it an ideal platform to deliver necessary content and services to the underserved population in India, providing an efficient and effective way to narrow the growing digital divide.

Introduction

Technology is progressing at a phenomenal pace. The power of computers, mobile phones, and the internet has brought to our fingertips a vast amount of data and services from which we can continually learn, engage, and improve. However, this knowledge remains out of reach for the world's population with little or no access to information and communications technology (ICT). Information poverty largely belongs to the underserved and marginalized individuals, for whom ICT could be a connection to a better life. Here I will go through the benefits of ICT and an explanation of the digital divide, then demonstrate how the explosive growth of mobiles can be harnessed to narrow that divide by being a platform for inclusive content. However, content is only useful if it can be utilized by the audience for which it was intended. I will provide three examples of programs available via mobile phones, and from these cases provide conditions to ensure such content is taken up by the intended underserved populations. Lastly, I will look at implications of these conditions and assess the growth potential for inclusive content via mobile phones.

The Digital Divide

The digital divide is widely understood to be the gap that exists between those with effective access to digital and information technology and those with limited or no access at all. [1] At the 2002 World Telecom Development Conference, it was noted that the digital divide is not just about access to technology, but also about various dimensions related to the issue. Essentially, the true divide is with access to information and services, and it is widely recognized that ICT is the most effective way to access an enormous breadth and depth of information. True empowerment lays in the knowledge of and access to services and information that being a fully enabled digital citizen implies. We can 'expect to see increasing returns with more people connecting to the digital networks, but should also recognize that technology does not create inclusive opportunities without human intervention'[2].

Why is ICT Important?

ICT enables access to a bank of knowledge, financial services and more. International research has shown that the existence of ICT translates into general economic growth and development for any nation. [3] For example, a study from the London Business School in 2005 concluded that an increase of 10 mobile phones per 100 people in developing countries in Africa would increase GDP growth by 0.6%.[4] The promise of ICT for developing economies such as those in Africa and India are especially great.

A great number of India's 1.2 billion person population continues to be underserved in areas such as health, education, hygiene, and sanitation, and the problem continues to grow along

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[1] http://en.wikipedia.org/wiki/Digital_divide
[2] http://jmk.sagepub.com/content/28/4/397.full.pdf+html
[3] The State, IT and Development, pp 103
[4] http://www.comviva.com/media/news_BBC.pdf

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with India's tremendous population size. ICT can cost effectively and efficiently link India's vast network of underserved slums and rural, remote villages with the urban knowledge centers for which India has now become well known. For example, by distributing knowledge of best practices via ICT in areas such as farming, which still constitutes two-thirds of livelihood in India, there is the potential to effectively better the lives of millions of Indians. However without access to ICT, a large portion of India's population will continue to have difficulty accessing necessary and important knowledge central to their livelihoods and well being. This population is in danger of falling ever further behind. According to McNair (2000: 10),

> Easy access to ICT enables people to become richer … it is moreover the already educated who disproportionately take up lifelong learning activities and who in general get better services. In short the educated information rich become richer and the less educated information poor become poorer.

This "information poverty" can be addressed with reliable access to information technology, which can cost-effectively deliver content across diverse populations and geographic regions.

Traditional ICT Delivery
The digital divide has traditionally been defined as access to computers and the internet. When we look at worldwide use of the internet, 88% of the world's internet users are in developed countries. This leaves a small portion of users in emerging economies, which is reflected the rate of India's internet use at a dismal 8% of the population (100 million users), of which 12 million are in rural locations. For these rural users, obtaining access is particularly difficult. 18% of India's rural internet users travel more than 10km to access the internet, [5] typically to cyber cafes or telecenters.

Infrastructure continues to be a stumbling block for internet use in rural India. Fiber connectivity and a reliable source of electricity are significant obstacles; others include servicing and maintenance of the computers. Even of the population that could afford a computer, only 3% of Indians have a PC in their home.[6]

When connectivity is available, very often the connection is via dial-up and as a result quite slow. The average internet speed was .8mbps in Q3 2010, representing a year over year decline of 9.1%[7] and significantly worse than the world average of 1.9 mbps. More tellingly, 35% of internet connections are below 256 kbps, the minimum level at which broadband is defined in India. This is indicative of a dial up connection, more than likely located at the rural level. While having a slow connection is arguably better than none at all, these stats go further in demonstrating how the richness of information and content on the internet continues to be out of reach for most of the population in India.

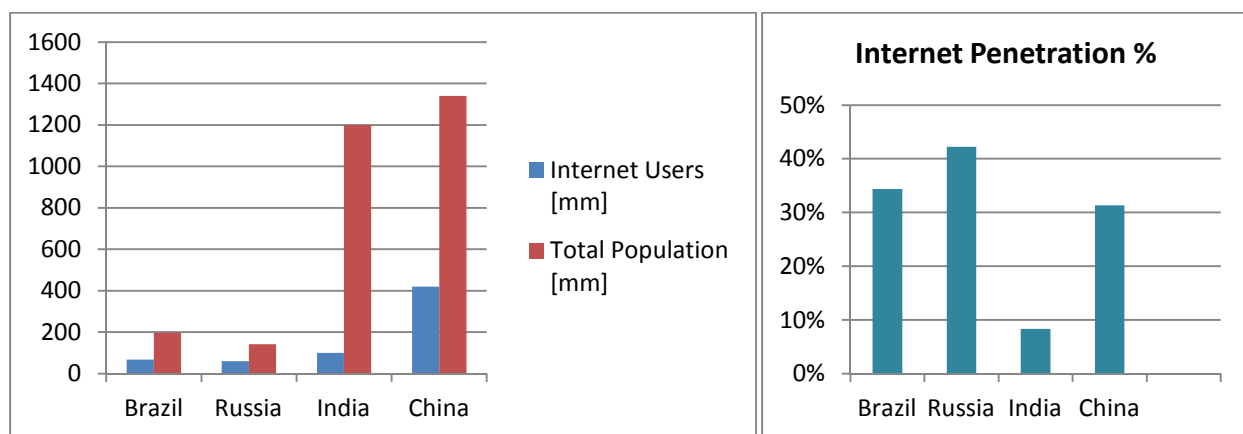[5] http://thenextweb.com/in/2011/05/02/get-to-know-the-india-tech-scene-in-59-quick-slides/

[6] http://www.thehindubusinessline.com/industry-and-economy/info-tech/article2415307.ece

[7] http://articles.timesofindia.indiatimes.com/2011-05-11/internet/29531813_1_minimum-broadband-speed-internet-speed-internet-connections

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There are challenges for internet use outside of infrastructure as well. India's adult literacy rate is pegged at 74%[8], with some states such as Kerala performing substantially better (93%) and others such as Bihar substantially worse (64%). Without basic literacy, many are left unable to fully utilize the internet. This literacy is spread out across India's 23 recognized languages, so that even of those that are literate, less than 30% are believed to be literate in English.[9] Since much content on the internet is in English and very little in local dialects, it is useless to a great majority of Indians. Sites containing content in local languages are beginning to emerge, but it is by no means widespread. This adds to the poor usage of computer centers to access important data, and leaves many to use cyber cafes and telecenters for entertainment content ("timepass"), much to the chagrin of owners.[10] Finally, many Indians are simply not comfortable with using a computer. The lack of easy access, high cost, and poor infrastructure means that many Indians have never seen or used a computer before. For them, the prospect of learning how to use a computer and then accessing the internet is a daunting task.

India versus the other BRIC nations

The BRIC nations are Brazil, Russia, India and China. These four countries are grouped together because they are identified to be in the same stage of rapid economic growth and development. However India continues to lag behind its peers with regards to ICT and other key economic measures. According to the 2011 Digital Inclusion Index by Maplecroft, India is the only BRIC nation to be classified as "extreme risk", meaning that a large portion of its population suffers from a severe lack of digital inclusion.[11] Brazil, Russia and China are all classified as "medium risk". The following graphs show India's position in internet penetration countrywide in comparison to the other BRIC nations. It is notably behind the other nations, with an 8% penetration rate.

Another challenge that has stymied internet use in India is the diversity of languages within the country. Russia, China and Brazil each have one official language: Russian, Mandarin, and

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[8] http://censusindia.gov.in/
[9] Imagining India: The idea of a renewed nation, pp 89
[10] http://iis-db.stanford.edu/pubs/20972/ICT_full_Oct05.pdf
[11] http://maplecroft.com/about/news/digital_inclusion_index.html

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Portuguese, respectively. India has 23 official languages, including English. This creates difficulties for standardization of content, particularly for internet use. Also linked to the low use of the internet is the lower than expected literacy rate in India, which as previously noted, is 74%. China's literacy rate is 96%, Russia 99.5%, and Brazil's 90%. India's tailing position on these dimensions helps to explain why the internet continues to have such a low rate of penetration nationwide.

Mobiles in India
The one bright spot in ICT in India is the explosive growth in use of the mobile cell phone. Currently, mobile phone use amounts to 791 million, approximately 67% of the population (based on a population size of 1.2 billion), with the rural base growing at the fastest rate. Mobile phones have an inherent advantage over traditional ICT. They do not require the same infrastructure needs, such as a wireline connection, consistent source of electricity, or relatively frequent servicing. They are also more affordable in comparison to PCs. A low end handset in India can be purchased for little as 400 INR(~US$9), compared to a PC which ranges from 20,000 – 30,000 INR (~US$450 – $700). This price difference is significant considering that many Indians earn no more than a few hundred rupees a day, and some earn much less. For those that earn less and for which $9 would be a significant sum of money, it is common to see households sharing mobile phones. There are also mobile phone rentals available in many villages, but few comparable services exist for PC use.

Other benefits of mobile phones include the ability to deliver content via voice, eliminating the need for literacy. It can also be surmised that Indians feel a relatively high sense of comfort using a mobile phone, since compared to other ICT innovations mobile phones require less skill to use.[12] It is evident that the growth in use of mobile phones is a significant inroad towards addressing the digital divide in India. According to a Deloitte study in India,

> The reach and penetration of mobile phones can ensure the delivery of a large number of services in a cost effective, fast and seamless manner even without physical access.[13]

A challenge that continues with traditional mobile phones is the English language keypad and SMS usage. Although India has a large English speaking population, literacy overall is quite low, rendering the SMS and other capabilities on the mobile useless for most of marginalized population. Most mobiles in India are also equipped with functionality in Hindi, but the keypad and SMS are still unutilized by a large proportion of the population. In addition, programs exist that convert English text to local languages, but they require first the knowledge of English. Such obstacles continue to stunt the use of SMS among lesser educated populations.

Content for the Mobile Platform
Internet use via mobile phones is growing; approximately 40 mm Indians access the internet via their mobile device, but internet enabled mobile phones remain largely out of reach for the

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[12] http://jmk.sagepub.com/content/28/4/397.full.pdf+html, pp 9
[13] Deloitte ASSOCHAM MVAS study, pp 14

poorest members of Indian society due to handset cost. Basic internet enabled phone ("smartphone") prices begin at 2,000 INR (~US$45) and increase exponentially from there. Therefore, developers are using creative ways to deliver content via basic handsets that is relevant, useful, and that ultimately empowers the most marginalized members of Indian society. These services are grouped into the category of Utility mobile value added services (MVAS), as coined by Deloitte Consulting. MVAS is recognized for mostly entertainment applications such as gaming, books, and social networking, but is growing to include utility services that promote inclusive growth in six categories: health, education, agriculture, law, commerce, and governance.[14] The growth, penetration and familiarity Indians have with the mobile phone make it the ideal platform to deliver information and services that encompasses the ecosystem of the digital divide.

However, not all content delivered on mobiles is utilized by the poor or marginalized population. Many mobile applications do not cater to the specific needs of this population, such as their lack of literacy or inability to use English/Hindi SMS capability. In addition, a great deal of villagers still have a standard of subsistence living and may not have the time or interest in becoming aware of nationwide or global issues. Applications that can help them improve their daily lives are therefore of great interest. Keith Fulton, Executive Director at America Online, writes that:

> "According to some research, we spend 80 percent of our time within a ten-mile radius of our home, but only know about ten percent of the resources in that same radius. While we are enamored with the global implications of the Internet, over time we will also use the Internet to learn more about what is in our own backyard." (Fulton: 2000)

It is clear that helping marginalized populations become aware of the resources within their own villages or directly available to them has great pull. We have seen previous ICT models such as telecenters fail even when they have been successfully connected to the internet and electricity. This has been attributed firstly to a lack of content relevant to villagers, according to a 2005 Stanford Study on telecenters in India. The Stanford study describes the need for a "killer application" to draw interest to the centers and to the internet and computers in general, and concludes that for villagers, this application is government services.[15] Since government services are slow to become digitized (but not impossible; several states have online and mobile schemes for health services and other services) this leaves ICT in a state of disuse in most areas where telecenters have been installed. Does this mean that ICT will continue to be poorly utilized until government services come onboard? I believe that the answer is no. Villagers and slum dwellers are inherently interested in government services because it directly affects their lives and it is a service over which they have little leverage. They are often at the mercy of local government agents to receive subsidies, school tuition, and other services due to them. However, there are many more services that could pique their

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[14] http://www.deloitte.com/assets/Dcom-India/Local%20Assets/Documents/Deloitte_ASSOCHAM_MVAS_Study.pdf
[15] http://iis-db.stanford.edu/pubs/20972/ICT_full_Oct05.pdf

interest, provided they are delivered in a meaningful and useful way. Examples of such services are explained in the next section of this paper.

As far as becoming aware of the services that are available to them, villagers still trust local leaders and community based organizations for accurate, reliable information. Marketing traditionally appears to be mainly conducted by word of mouth[16], which would make sense given a general lack of information technology available to villagers. Word of mouth advertising occurs when the product is well received by customers, who then recommend the product to people in their social network. Customers must be quite satisfied with a product or service in order to recommend it to friends and family, since their reputation is on the line. Thus content and awareness are linked.

Criteria for Content

From these points I have identified the following conditions important for the success of content designed for inclusive growth:

- Availability of localized information
- Awareness of available content
- Addressing illiteracy/language constraints of users

With this methodology, I identified three mobile applications that utilize all three conditions. These applications are notable because all have been finalists or winners of various awards, including the NASSCOM Social Innovation Honors, which awards innovations in ICT for a social cause. They have been vetted by experts in technology, business planning, and social impact for their potential for social change.

Case Study 1: Gaon Ki Awaaz

> As Dean at the International Media Institute of India (IMII), Sunil Saxena had always approached social problems with an academic viewpoint. After noticing that the inhabitants of even the most rural villages owned mobiles, he began to wonder how those mobiles could be used as a platform to improve these villagers' lives. The promise of ICT had always been out of reach for most villagers, but the advent of mobiles created a gateway to connect this long excluded population to the mainstream.

> After thinking deeply about what villagers needed, Saxena decided to create a pilot of 20 people to receive important localized information via an audio blast in the local language. The model consisted of training two villagers as reporters to create and submit MMS bulletins, which were then converted and transmitted as voice calls via mobiles in the local dialect twice daily – one at noon and the other at five p.m. These calls would inform villagers of happenings like thefts, strikes, fires, village fairs, and also communicate government directives on employment, health care, and farm prices.

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[16] http://iis-db.stanford.edu/pubs/20972/ICT_full_Oct05.pdf, pp 34

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The initial pilot had such positive feedback that the group was expanded to 250, the current max that Saxena and his team could accommodate. They decided to begin charging a 10 rupee subscription fee to partly cover costs associated with training and hiring reporters, paying a communications team to convert MMS files to an audio format, and transmission costs. This fee was collected by a trained individual, going from home to home to confirm subscription renewals or collect new ones. The previously mentioned costs, when completely factored in, came to 42 rupees per audio bulletin sent. Saxena also decided to accept ads from local businesses to be placed within the audio bulletins to generate additional revenue. He charged 20 rupees per 30 second advertisement. Businesses that advertised, such as the local internet center, saw a spike in customers after the ad aired. However, even with a 10 rupee subscription fee and local village merchants advertising, there was not enough revenue to cover the 42 rupee cost. Saxena calculated that he would need one crore rupees over one year in order to scale up the project to 10,000 villagers and attract national advertisers to market via the audio bulletin.

This solution utilized the pervasiveness of mobiles, overcame the issue of low literacy among rural populations, and addressed the local language issue while giving villagers access to relevant content such as welfare schemes, thefts, and religious events. The model also contained an element of sustainability, serving as a platform for local advertising and attractive enough to warrant a subscription fee.

However, a key impediment to the project's success was its scalability. Saxena tried repeatedly for outside investment in order to scale up but was unable to attract investors. This was attributed to the people intensive nature of the project, which required two on the ground reporters from each village to track local news as well as a third person to collect fees. They model would be difficult to improve because the hyper local nature of the news content requires someone on the ground, in each village, to identify what would be of interest to the local villagers. What simultaneously makes the application relevant and thus successful also inhibits its ability to scale effectively.

Case Study 2: ADR India

Corruption in India's political system has been an ever present challenge for the country. While many complain, there are few who have taken action to battle this corruption. An exception to this has been the Association for Democratic Reform (ADR), led by Anil Bairwal.

Bairwal was drawn to ADR after the courts ruled in its favor for a Public Interest Litigation (PIL) it had filed. ADR, consisting of a team of IIM professors (What is IIM?), had asked for mandatory disclosure of the criminal, financial and educational background of candidates running for election to the Parliament and State Legislatures. This landmark decision was held up even after being contested by the Government of

India in 2002. It required all candidates nominating themselves in elections to Parliament and State Assemblies to submit their nomination forms along with affidavits containing criminal cases pending against them, their financial assets/liabilities and those of their families, and their educational qualifications.

Bairwal and his team at ADR understood all too well that the passage of laws and requirements meant nothing if the newly available information could not be utilized. The current method of disseminating candidate information only days before an election was not the ideal way to drive awareness. Creating a central database online for entering and storing the data would be an ideal way to aggregate the enormous amount of information that was collected and make it easily digestible for any user. ADR commissioned Webrosoft to design and develop software that could analyze and verify candidate data entered by ADR employees. Citizens could access the front end of the software where the data was aggregated via myneta.info, through a helpline, or via an SMS. The SMS and helpline were available in local languages, making the program accessible to most of the population who wanted this information.

Thousands of people have accessed the site, received SMS, or called the helpline for more information about candidates' assets, criminal records, and educational background. The success of the site has also led members of various political parties to call for a consensus on barring candidates with criminal backgrounds from running for office.

This application utilized all forms of ICT to deliver its content, but it is notable that SMS and the helpline were offered in local languages to make the content accessible. ADR also plans to begin collecting candidate information at the village level, for the village councils known as *panchayats*. A move towards even more local data suggests that the relevance of content is an important factor in driving the utility of the information. The challenge for ADR again lies in an effective way to collect such data as there are thousands of villages in India.

Case study 3: MKrishi

Tata Consultancy Services has a history of prioritizing innovation. As a firm, it has begun to direct this innovative outlook towards base of the pyramid solutions. One of these notable innovations is mKrishi, led by Dr. Arun Pande, head of TCS Innovation Labs. After spending two years researching farming needs across India and discovering that farmer's questions were often very localized, the design plan for mKrishi was born.

MKrishi delivers farmer specific information via mobile devices. Via a platform they download from a cellular network partner, farmers are able to call or text a helpline with experts in farming on the other end. To create a further level of personalization and ensure that experts are fully equipped to answer farmers' questions, each farming locale is equipped with an automatic weather station and crop and soil sensor technologies. The weather station is powered with solar technology to ensure it

continues to function even when electricity is unavailable. The stations monitor the local farming conditions, enabling experts to provide specific recommendations in areas such as fertilizer requirements based on soil conditions and pest control. mKRISHI also enables farmers to send crop images (provided they own a camera phone) to the experts which enables the experts to understand the problem faced by the farmer more clearly. Farmers pay between 50 – 100 rupees a month ($1-$2) for the service.

In the future, TCS envisions having a "village entrepreneur" take on the cost associated with purchasing and installing the weather station and crop and soil sensors. The entrepreneur can then charge the farmers for using the service. TCS also hopes that corporations will see the value of such a platform for delivering goods and services and pay for future partnerships.

This project utilizes the prevalence of mobile phones to deliver hyper local information to an underserved population. It is also equipped to serve both high and low end handsets. The challenge that again emerges here is turning the project into a self sustaining one. Weather stations and crop sensors are expensive equipment to maintain. Additionally, hiring experts to serve farmers will necessitate a large team who can understand the hundreds of dialects across India.

Implications of Research

The advantage of content via mobiles is that it comes directly to the user and by necessity, provides a "snapshot" of information. This eliminates the potentially overwhelming activity of sitting down at a computer and searching for the necessary information. Many Indian users are not comfortable with computers and have no idea how to begin searching for information they need. By giving villagers access to information via a mobile with which many are already comfortable, the chances of their continuing to access that information grows. Thus, mobiles address the dual nature of connectivity and comfort with technology, which has historically hindered the growth of traditional ICT in India. They also do not require the delivery or maintenance of computers or the use of electricity (basic handsets can be recharged using a hand-cranked device). In addition, mobiles do not require literacy since they can be used exclusively as voice devices. By leapfrogging all the major issues of traditional ICT delivery in India, mobiles have the ability to be a life changing method of information delivery to the rural poor. However by taking away the focus on basic delivery, mobile applications confront the more difficult challenge of creating relevant content and delivering it in a cost effective manner.

As reflected aptly in the previously mentioned cases, the projects foment inclusive growth by focusing on delivering localized content. Having a narrow focus addresses the unique needs of each village the projects are based in, thereby leading to word of mouth awareness and runaway success in each location. In addition, all offer content in local languages and do not literacy by offering a voice option. However, all the projects suffer from (or will eventually suffer from) the lack of a scalable delivery method and sustainability. They rely on outside funding, either donor or corporate, to continue operating and in the future, to grow. The Gaon Ki Awaaz model earns revenue from subscriptions and advertisements, yet only covers one-

third of its costs with such earnings. The remainder comes primarily from the journalism institute at which the founder was employed. The model also requires several local village people on the ground to keep the project running smoothly. If expanded across villages, the number of people that need to be managed to keep the project going will grow exponentially, and likely issues alongside that. This has been the principal reason the project has not received funding to grow despite the founder's best efforts.

For mKrishi, TCS has recognized that the project is hyper local; it was designed to be that way and is the principal reason for its success so far. However, finding experts across regions to answer farmers' calls and the inclusion of expensive field sensor technology add a layer of difficulty to scaling the project. The goal of attaining sustainability by using a "village entrepreneur" to pay for the equipment is potentially possible; the challenge will be ensuring the entrepreneur charges rates that are affordable to even the poorest farmers, so that the project can achieve the inclusive growth intended. The advantage TCS has in truly scaling this project is its position as a large, influential organization in India. It has access to capital for investing in prototypes of such ideas and to people of influence to create awareness of the project. However it is not clear whether mKrishi would survive on its own if TCS withdrew direct support.

ADR India was not positioned as an application specifically for the mobile phone, unlike mKrishi and Gaon Ki Awaaz. However, the availability of an SMS and voice option clearly demonstrates how such technology must be part of a service provider's offering in order to be truly inclusive. ADR is also strictly a non-profit and will rely on outside funding such as grants and donations for the duration of its existence.

The rise of mobile applications focusing on hyper local, accessible content addresses many of the issues of bridging the digital divide. However, such applications will not succeed if they cannot be replicated or sustained financially.

Why hasn't hyper local content taken off?

As identified previously, the challenge for hyper local content lies in the inability to deliver content on mobiles in a cost effective manner. Most projects that are striving for sustainability need an infusion of capital to grow; from there, they have the potential to attract the attention of large corporations and foundations that can either fund them or use them as a platform for their products. Once the programs grow, equipment can be purchased in bulk and training standardized to streamline costs.

However, managing local content requires on-the-ground work and the involvement of local communities to address particular needs. In addition scalability is an issue because by definition local content would differ in each location, so creating a standard model to scale up is quite difficult. These components lead to a typically unsustainable cost/revenue model. Such difficulty scaling up and creating profitability is unattractive to investors who would offer the infusion of capital necessary to build out the projects and attract the attention of larger

corporations. Social impact investing in India is still in infancy; angel and venture capital investing are only now beginning to become popular. In addition, many organizations simply do not have the business expertise to put together a plan that is attractive to outside investors. Other strategies for funding include attracting the attention of a corporation for its corporate social responsibility (CSR) program, or working directly with the government to obtain funding. These methods tend to be based on how well connected the organization is, since there are limited CSR opportunities and a general lack of transparency from the government on projects it chooses to fund. Until impact investing begins to grow in popularity in India, social enterprises such as those discussed earlier will continue to struggle for funding and sustainability.

It is important to note that not all organizations providing content for mobile phones are striving to be sustainable or profitable. Many simply want to deliver important services to the poor and are generously funded by outside organizations or the government to do so, such as ADR. However, even for those that are funded, it is important to keep in mind the often high costs of delivering hyper local, on the ground information to villagers since funding can fluctuate.

Future Growth
As India continues to struggle with basic infrastructure, literacy rates, and diversity of languages, mobiles appear to be the road to the future. The government should consider investing in strategies to allow mobiles to continue to proliferate. Such strategies should include making mobiles accessible to those living on a few rupees per day. Microfinancing and payment plans for mobile phones could be one such solution.

Another strategy as mobile phones saturate India is the rise of the smartphone. As mentioned earlier, over 40 million Indians access the internet via their smartphone. 59% of these users only access the internet via their phones.[17] As smartphone use spreads and hurdles remain with fiber connectivity and electricity, it is likely that such exclusive mobile internet use will continue. The cost of smartphones will continue to fall as the technology improves. One can imagine a future where smartphones will become as prolific as the basic handset in India. However in order to enable this future, the Indian government must continue to invest in technology to allow data browsing by hundreds of millions of customers. Smartphones have more power needs than a basic handset, so the need for providing a reliable connection to the grid across India will continue. By providing easy access to the internet, the smartphone is poised to become the enabling device for Indian citizens to fully close the digital divide.

Conclusions
Mobile phones have the potential to be the device that helps millions of impoverished Indians bridge the digital divide and gain economic advantage. This can be achieved by mobile phones

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[17] http://thenextweb.com/in/2011/05/02/get-to-know-the-india-tech-scene-in-59-quick-slides/

being the platform to deliver inclusive content to the most marginalized and hard to reach populations in India. Three key conditions to remember when developing mobile applications for inclusive content:

1. Hyper local content – Generally speaking, users of the internet and ICT are drawn to relevant, usable content and villagers and other hard to reach populations are no different. Since needs vary from region to region and village to village, a one size fits all prescriptive solution is not ideal. Therefore an application with localized content has the most promise for uptake and continuous use by underserved populations.
2. Awareness of application – content can only be utilized if villagers are aware of it. Much advertising in rural locations is word of mouth by necessity. If the mobile phone application has "killer" content, word of mouth will follow, so awareness and relevant content are tightly linked.
3. Addressing illiteracy and diversity of languages – 26% of Indians are illiterate. There are 23 recognized languages, with hundreds more spoken. Any application that hopes to be truly inclusive must address these constraints.

The explosive growth of mobile phones now and in the future holds much promise for India's most underserved people. Their role now as facilitator to closing the digital divide could change to the lead role, as technology advances and mobiles continue their unprecedented spread across India.

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Appendix B: Websites

Census of India
http://censusindia.gov.in/

Telecom Regulatory Authority of India
http://www.trai.gov.in/WriteReadData/trai/upload/PressReleases/830/Press_Release_May-11.pdf

Tata Consultancy Services
 http://www.tcs.com/offerings/technology-products/mKRISHI/Pages/default.aspx

The Next Web
http://thenextweb.com/in/2011/05/02/get-to-know-the-india-tech-scene-in-59-quick-slides/

Mobile Phones in India