

Implementing ICT's in Third World Countries

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In today's world, technology is not only a luxury but an essential part of life. Technologies are becoming organic and can be found almost anywhere and in anything. Fifty years ago, the first digital computer took up an 1800 square foot room and consumed 160 kilowatts of electrical power. Today, the digital watch that can fit in the palm of your hand, is faster, and runs on a battery the size of a dime. Nothing in history has advanced at such a rapid pace compared to computers and technology. Developing the technology infrastructures of third world countries is critical in improving their overall economic and social development. America has been on the forefront of technological advancements, but is the rest of the world keeping up?

Technology drives the world. One can look at any country and compare the greatness of its technology to the greatness of its wealth and power. Today technology surrounds the wealthy and powerful. It is only accessible to those who have money and those with the infrastructure to support it. What is involved with supporting technology? What kind of infrastructure is needed? We know that third world countries lack running water and often electricity. This population is often referred to as the world's "bottom billion."¹ The world's bottom billion are close to the population of the "U. S. and Europe combined."² They are the least technological with life expectancy in the fifty year

¹ (Heeks, ICTs and the World's Bottom Billion 2009)

² Ibid

range.³ When the rest of the world digitized they grew poorer. This isn't a new problem but it will only become worse as time goes on. The rate of technology growth is unlike anything the world has ever seen nor ever will.

Why do we need to concern ourselves with the bottom billion? Why is technology needed for the advancement of poor nations? More specifically, why are information and communication technologies (Information and Communication Technologies) needed for the advancement of poor nations? Everyday life is increasingly becoming more digital. This includes our economic, social, and political life.⁴ In order to understand this one must know what digital is. In simplest terms digital is numbers. Looking at this economically we see ourselves using less paper money and more credit cards. Socially, we communicate via cellular telephones, electronic mail, and social networking sites. Politically, politicians advertise themselves via YouTube and television. They make Facebook pages and thousands of people join their electronic campaigns from the comfort of their homes. Then we get in our cars and a small unit on our dashboard speaks to us and tells us how to get to the polling location where we cast our ballot electronically. When a nation is not digital they are excluded from all the benefits of digital technology and the many wonders of information and communication technologies.

³ Ibid

⁴ Ibid

“Since the beginning of the debate in developed countries about the effects of information technology on their societies and economics, consideration has been given to potential impacts, both positive and negative, on developing countries.”⁵ The impact of not having technology can be severe. The population loses access to critical social needs such as health care, education, and government services.⁶ These services are increasingly becoming “information based” in America and the rest of the world. Many health problems could be solved by transferring western health technology to developing countries.⁷ We have extremely advanced diagnostic equipment and health monitoring devices. Surgeries can be done robotically with the use of highly advanced equipment and extremely skilled professionals. Education services are lacking in developing countries. “In 2000, the average literacy rate in Sub-Saharan Africa was 52 percent for women and 68.9 percent for men.”⁸ Education is also becoming information based in Western civilization. We have the option to educate ourselves via the internet. Books and electronic documents can be accessed over the internet as well. There is an ongoing effort to digitize books making it easier for those with internet access to search and view published material. Instead of writing with pencil and paper we can process what we want electronically on our computers and then take it or send it wherever we want. Government services are also information based. When we do our taxes we can use

⁵ (Forester 1986)

⁶ Ibid

⁷ (Conrad 1993)

⁸ (Literacy in Africa n.d.)

online software and submit out taxes electronically saving time and resources. If we need a government form we can go to our state or federal web site and print one out. Our government officials can be contacted by electronic mail, facsimile, and telephone. In many cases if we are in need of information we can look it up via the internet without having to contact any government officials or traveling to their location to speak with them.

It may seem as simple as transferring our western technology to these countries. Examining how one country, China, implemented health care and technology we see it isn't. In 1992 the Chinese government created a policy that would implement Information and Communication Technologies in all social service areas and was reinforced in 2001 by Premier Zhu.⁹ There were "concrete measures" that have been put in place because of these policies in China including: "heavy public investment in ICT infrastructure; heavy investment in use of Information and Communication Technologies in the public sector; public—private partnerships underpinning the development of key ICT corporations; new legislation in the areas of intellectual property; and national education and training programs to diffuse ICT skills."¹⁰¹¹ In China the amount of internet users has rapidly grown. From 2002 to 2004 the amount of internet users doubled.¹² This study of technology in China is important because this expansion is transforming the country and

⁹ (Heeks and Zheng, *Conceptualising Information Culture in Developing Countries* 2008)

¹⁰ (Lu 2000)

¹¹ (Haider 2002)

¹² (Heeks and Zheng, *Conceptualising Information Culture in Developing Countries* 2008)

the culture; the “information culture.”¹³ This fundamental driving force behind the change in China can also be found in other developing countries.¹⁴ The healthcare sector in China now has a “technology-driven view.”¹⁵ However, because technology was implemented too fast and in a “techno-centric” way, the healthcare infrastructure systems are not of high quality and sometimes setup in improvised fashions.¹⁶ This example of China should be used when considering implementing Information and Communication Technologies in other developing countries. If implemented too fast without the proper infrastructure or support system it can hurt more than it can help. One manager in China states, that the Health Care Information System in China “has gone too far ahead of our management; too many expectations have been put on our information systems, which are unrealistic without the managerial, institutional, and cultural support.”¹⁷

The quote from the manager in China brings about issues surrounding “information culture.”¹⁸ Information culture issues can be analyzed in two parts: “information literacy and information openness”.¹⁹ Information literacy in itself can also be broken down into three categories that include the ability to use information technologies, the ability to work with data and information produced by it, and old fashioned literacy in itself. Even though China as a very high literacy rate, around “91%

¹³ Ibid

¹⁴ (Huchet and Ruet 2006)

¹⁵ (Heeks and Zheng, Conceptualising Information Culture in Developing Countries 2008)

¹⁶ Ibid

¹⁷ Ibid

¹⁸ Ibid

¹⁹ Ibid

in 2003”, its high population leaves over “100 million” adults illiterate.²⁰ As mentioned before, China had a doubling of internet users between 2002 and 2004, but with its high population this still leaves “over 90% of the population without internet access”.²² It may be safe to assume that those without internet access also lack education or working knowledge of computers and information technology. China must make efforts to educate its population in technology use considering the amount it spends on technology versus the amount spent on technology education. The country spends about 2.5% of GDP on skill investments compared to 30% on technology investments.²³ When implementing Information Communication Technologies in developing countries care should be taken not to implement them in this way. “There are too few skilled workers to effectively operate the new technology that is being rapidly introduced into China”.²⁴ We again see how this affects health care and the use of technology. Unskilled workers will not be able to operate technology equipment or understand data and produces. This will in turn affect the citizens of China that rely on health care services. The second information culture issue is information openness. This is especially prevalent in China where citizens are censored as to what information they are and are not allowed to view via the internet.

²⁰ (UNDP 2005)

²¹ (Heeks and Zheng, Conceptualising Information Culture in Developing Countries 2008)

²² Ibid

²³ (Heckman 2003)

²⁴ Ibid

With the Chinese health system different departments often do not share information because of the way the health information systems were designed or “not designed”.²⁵

What can we learn from the way China has implemented technology within its society? China has spent a great amount on technology while spending less on educating the population on how to use the technology. “They may thus be increasingly digitally-connected but largely information-illiterate”.²⁶ Those countries that are in the beginning stages of developing their information and communication infrastructures need to learn from the practices of China.

There still lies an unanswered question; a big one. “How will we deliver the Internet to the remaining five billion” people of the world that doesn’t have it?²⁷ “From the mid/late-1990s to the mid/late-2000s” the normal way of connecting poor communities to the internet was by building small buildings with a few computers connected to the internet.²⁸ There was a global effort to build these “telecenters”, but they ultimately failed for two reasons: sustainability and scalability. The projects didn’t last very long or provide the necessary needs to the communities they were built in. As far as scalability, the centers did not reach far enough to be of much good for surrounding communities. This leaves us with the need for better delivery of information and communication technologies in these poor nations. We must look at the hardware used to

²⁵ (Heeks and Zheng, Conceptualising Information Culture in Developing Countries 2008)

²⁶ Ibid

²⁷ (Heeks, The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? 2009)

²⁸ Ibid

deliver information to people. The standard way of connecting a computer to the internet is not practical in countries that do not have the infrastructure to support it. Different mediums must be looked at for delivering internet and information to poor communities and citizens. From this point forward trends surrounding the internet connected computer in developing countries should focus on advancing three innovations: terminals, telecommunications, and power or electricity.

The world has seen initiatives in terminal technologies. Most commonly the One Laptop Per Child project has been the most recognized and largest.

Telecommunication technologies include mobile phones, wireless, and satellite technologies. “Wireless has become the delivery mode of choice to provide connectivity into poor communities in the global South”.²⁹ In the past, particularly the 1980’s and 1990’s, focus was put on satellite technology as a means to deliver internet to low income communities.³⁰ However, that has changed and we now see a trend towards “land based” technology that requires wireless systems similar to Wi-Fi. Wi-Fi has also been transitioning to WiMAX technologies which have further reach distance and better coverage capabilities. WiMAX does not always reach far enough into many communities and can be costly for low income nations.

²⁹ Ibid

³⁰ Ibid

Power and electric technology a crucial aspect to consider in the development of poor countries. For example, “only 15 percent of rural households in sub-Saharan Africa [have] access to electricity”.³¹ It is crucial that we invent new power technologies such as higher capacity batteries, new ways to transmit electricity that are low cost, and new devices that consume very low amounts of power.³²

There is a technology not uncommon around the world that many of us, young and old, use presently. Mobile phones may be the answer and delivery method of internet and communication means for poor and developing countries. Mobile technology is already reaching the hands of poor citizens. “More than two-thirds of the African population” has mobile technology at present.³³ The big question is whether or not it’s the right technology to meet their needs and whether or not people are being educated on the use and applications of this technology. We do not want policy makers making the mistakes of China and their development of technology. Current mobile offerings cater to the “teenage texters” with devices such as the Iphone and business users with devices like the Blackberry phones. The rate of mobile phone usage is “currently fastest in the poorest regions” and “current growth rates will likely carry usage well over 90% of the world’s population”.^{34,35}

³¹ (Measuring Village ICT in Sub-Saharan Africa 2007)

³² Ibid

³³ (A. 2008)

³⁴ (Heeks, The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? 2009)

³⁵ (T. Kelly 2007)

Looking at a case study of mobile telephone use in Nigeria, we can answer the big question of whether or not mobile phones are the answer to delivering internet and communication to the poor and developing countries. “Mobile telephony may provide an opportunity to address the informational challenges” of developing countries according to a case study done by Abi Jagun, Richard Heeks, and Jason Whalley.³⁶ In this case study the authors look at “micro-sectors” of business in Nigeria. One in particular, cloth weaving is analyzed through the whole manufacturing process; from the original supplier to the end customer.³⁷ Since this study is looking at mobile phones as “tools for the communication of information” they look at it from an “information-based perspective.”³⁸ For example, there are three steps in the supply chain and manufacturing process within the cloth weaving industry: information acquired prior to trading, information communicated during trading, and information acquired after trading.³⁹ These steps are all necessary and need some type of communication method to be successful. “The ability to communicate that information, are thus critical foundations for all trade and all enterprise, including micro-enterprise”⁴⁰ Why is the ability to communicate so important in a trade and business level?

Business in developing countries is competitive due to the lack of wealth in most areas. If one business has the tools to garner information that another does not, they will

³⁶ (Jagun, Heeks and Whalley 2007)

³⁷ Ibid

³⁸ Ibid

³⁹ Ibid

⁴⁰ (Porter and Millar 1985)

have a competitive advantage. For example, a trader may need information on the worth of a certain item. If he is not able to obtain that information, but the person he is trading with has the tool to do so, he may lose money in the transaction by trading for something of less value.⁴¹ Mobile phones can provide relief with the problem of having to communicate face to face rather than via the internet or telephone. This can slow down business, raise productivity costs, and only allow one to do business with a small area due to lack of being able to communicate with remote locations. It can therefore be said that “informational characteristics in turn shape both the process and structure of commerce”.⁴² Being that there has been a lack of information tools in developing countries, we have seen a trend in the way developing countries build up their “micro-enterprise supply chains”.⁴³ There are three trends that poor nations tend to have involving the trading process. Trading in these countries requires one to travel and make contact with the person they are trading with because of the lack of communication means. This process can be slow not only because the trader is required to make contact with each person, but simply because transportation means within and between communities is lacking and often non-existent. Revenue is lost when business is slowed down which is not positive for an already poor enterprise. The latter creates a second trend which is the high cost involved with trading in developing countries. Because there is a lack of communication and transportation means, there is no business done during

⁴¹ (Jagun, Heeks and Whalley 2007)

⁴² (Williamson 1975)

⁴³ (Jagun, Heeks and Whalley 2007)

travel time and money being spent to travel to and from locations. The third trend is the gamble taken each time a trade takes place. As mentioned before, the trader may be taken advantage of, or take advantage of someone else, if they do not have access to the same information and pricing information as their counterpart. So, what potential do mobile phones have in helping with all these problems trading industries in developing countries now face?

Most obviously, cellular communication increases the speed in which we communicate. This in turn reduces the cost traders pay for communicating by not having to travel from location to location for face to face communication. Along with speed, better information can be obtained for trading decisions. Trading would become quicker, less costly, and less risky, making positive changes in the currently negative trading trends.⁴⁴ This reduce in cost for the trader would in turn reduce the cost for the buyer of goods making a win-win situation. The market would expand and cover larger geographical areas with the ability to communicate without hindrance. Those who had to look to others for guidance and information would be “empowered” with the ability to obtain information on their own.⁴⁵

Those are all possible outcomes of implementing mobile technology into low income markets and communities. The Nigerian case study looked at the impact mobile

⁴⁴ Ibid

⁴⁵ Ibid

phones would have on supply chains at the “micro-enterprise” level.⁴⁶ The lowest level impression that mobile phones could have could be an enhancement in the speed of communication and decrease in cost of communication. This would be seen as a quantitative enhancement. The mobile technology could also have a qualitative impact, by “increasing the quality of information that is communicated for decision making”.⁴⁷ The three steps of trading, mentioned earlier could also be improved upon if the former two were true: information acquired prior to trading, information communicated during trading, and information acquired after trading.⁴⁸ The information needed before trades are made, could be obtained faster and more easily. In turn, this information could be relayed back and forth between the trading parties in a matter of seconds at very low cost. There would be no need to make onsite visits or costly trips to communicate information. The danger of these trips would no longer be a problem as well. Business would no longer be centralized to one small location since communication by mobile phone can reach out to anyone with access to a landline or mobile access. Traders would be able to work directly with the buyer instead of having to work with a middleman to obtain information they may not have had access to in the past. This would reduce costs not only for the trader but the buyer as well. This would change the whole structuring of the micro-enterprise by making business people more powerful with their new communication and

⁴⁶ Ibid

⁴⁷ (Bedi 1999)

⁴⁸ (Jagun, Heeks and Whalley 2007)

information tools. In turn, the local economies could be improved with the improvements upon the trading structure.

Do these possible improvements occur when mobile technology is implemented in developing countries? According to Jonathan Donner of Colombia University, small business owners in Kenya reported an increase in trading speed and reduce in cost.⁴⁹ Some research argues that mobile phones are only being used as a supplement for land line phones.⁵⁰ This is counter-argued by research showing that mobile phones are poor people's "first link to the network".⁵¹ The connectivity of the technology may be of greater value than its portability and convenience.

The particular research done in the Nigerian case study focuses on the cloth industry; specifically cloth for ceremonial purposes. This industry is said to be "buyer driven".⁵² An explanation of the trading process and figures involved follows. When someone has the need to purchase clothing, they go to the middle man who then approaches the weaver. All this negotiations requires communication between the buyer, middleman, and the weaver making the product. The buyer must also approve upon an initial design sample before the product is fully made and must also provide money upfront to secure payment. The middleman, most often, is responsible for purchasing the cloth and materials used for the product. If the buyer orders more than one item, each item

⁴⁹ (Donner 2004)

⁵⁰ (Jagun, Heeks and Whalley 2007)

⁵¹ Ibid

⁵² Ibid

is given to them upon completion and money is given at that time to begin making the next item.

To sum this process up, we have three figures in the process: the buyer, producer, and middleman. The buyer makes the initial order and can either be a single person or group of people in need of ceremonial clothing. This buyer, in most cases, works and communicates with the middleman. The middleman works like a salesman and provides opportunities for both the buyers and producer. They work and communicate sale agreements between both figures. If something goes wrong with the sale they are the person who is responsible for working the problem out and communicating an agreement. They are also responsible for ensuring that the needs of the buyer are met and fulfilled. The producers often work in groups under the watch of a head weaver. This is comparable to management based organizations in western culture. The head weaver is responsible for communicating with the middleman and in rare occasions the buyer. All three figures can be located in different locations from one another requiring travel at each point of the trading process. The producer must travel to the middleman to check for new orders. The middleman must travel to the producer to deliver new orders or talk about current ones and also to the buyer to approve upon designs and discuss new orders. The middleman must also travel to cloth suppliers to obtain new materials. Distances are normally within reason, but can often be longer due to “high traffic density in urban areas” and the “poor

state of the road surface”.⁵³ This can make the speed of the whole process slow and require people wanting to order products to put in an order “months ahead of the planned ceremony”.⁵⁴

In the study it was found that none of the people interviewed had access to a land-line based phone. However, each buyer and middleman did have ownership of a portable phone. Only about “one quarter” of the producers had a portable phone.⁵⁵ It was found that those producers who did have a cell phone were often buying it from the middleman they worked with. They would either buy “air time” or have the monthly cost deducted each month but the middleman.⁵⁶ Some producers would borrow cell phones from their friends or other family members.

The study found “two main process-related benefits” from the use of cellular phones.⁵⁷ The improvement upon the time it takes to make transactions as well as financial costs was noted in the study. The figures in the study typically used cell phones for the following reason during the buying procedure. The buyer would use a cell phone to initiate conversation with either the middle man or the original producer and make a sales inquiry. The middleman or producer would call each other to discuss potential orders. If a sale seemed worthwhile, the middleman or producer would call the buyer to confirm the sale before starting production of the product. Once the sale has been

⁵³ (Jagun, Heeks and Whalley 2007)

⁵⁴ Ibid

⁵⁵ (Jagun, Heeks and Whalley 2007)

⁵⁶ Ibid

⁵⁷ Ibid

confirmed, the middleman would call the cloth supplier to make sure they have the material needed and to schedule a pick up time and payment. All three figures used cellular phones to communicate with each other and make changes and confirmations of sales. Most communication was done by mobile phone. When a mobile phone was used, calls averaged \$.04 per minute versus \$8 for the average cost of a taxi trip.⁵⁸ So, it is true that mobile phones can lower the cost of doing business for those in developing nations and also increase their ability to communicate. These same benefits can also be true for the citizen not doing business. Instead of one having to travel to be able to communicate with a government official or health care representative, they can call them my mobile phone. The current mobile technology that has been in use in poor countries is GSM based and typically does not offer the technology to browse the web or use other mobile applications that are reliant on high speed connections such as 3G technology.

The downside to not being able to use high speed or internet browsing applications is the inability to “find” things. For example, a buyer looking for someone to produce ceremonial clothing would not be able to browse the web for a producer. They would still need to go to a middle man who knows producers and can make the connection. This effects the citizen also who is not able to look up government or healthcare information.

Developing countries will continue to grow its use of mobile phone use. “Current growth rates will likely carry usage well over 90% of the world’s population”.⁵⁹ If we

⁵⁸ (Jagun, Heeks and Whalley 2007)

⁵⁹ (Heeks, The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? 2009)

want to develop countries the right way we must make changes to the way people use mobile phones. This involves creating new device, application that run on these devices, and infrastructures to support the devices. Manufacturers can look at current technology and make adaptations to it to meet the needs of the developing countries. For example, the iPhone was developed to support many applications and allow developers to build applications with many uses. Hardware is step one of the problem. Devices must be built that support a rugged environment and are scalable to allow support of future application builds. This can be mobile phones or small PC devices like the One Laptop Per Child. BlackBerry phones are also examples of devices that support web applications as well as the ability to use email and word documenting.

Applications are step two that must be addressed. We cannot build applications the same way we build them for the western and other developed civilizations. The user interface that people interact with must be “usable” for the category of people obtaining to it. This is not to say that all of the citizens in poor nations are illiterate. It has been suggested that “adult literacy even in the poorest countries of the world is still greater than 50 percent”.⁶⁰ This would mean that everyone would have access to a neighbor or friend who is literate and can help and teach the other. Applications must also be developed that pertain to the local heritage and culture of its users.

This leads us to the data and information obtainable to people. If users obtain the means to access information via the internet, it is useless if the information they need does

⁶⁰ (Heeks, The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? 2009)

not exist in digital form. We must create projects like Wikipedia that cater to the cultures of these developing nations and provide data that is useful to them.

Where does the poor obtain funding for this technology? Money needs to come from multiple resources and should be a collaborative effort. Corporations have provided funding in the past and continue to since they see these citizens as potential customers. Companies such as “Cisco, Hewlett-Packard, Intel and Microsoft” are known to give money for development projects.⁶¹ Unknown IT companies in the south such as “Datamation and Wipro” are less known but also have been known to contribute.⁶² The governments of the developing countries have increasingly been providing funding from pressure by world leaders and citizens of their nations. The United States spends at least \$2 billion per year on Information and Communication Technologies for developing countries.⁶³

In order for the development process to work, it must be carried out correctly. “The root of a number of [Information and Communication Technology] failures is identified as their techno-centric approach, dominated by an informatics worldview”.⁶⁴ We cannot have smart computer scientists solve the world’s technology gap. Nor can we have government throwing money at technology under the belief that technology solves the world’s

⁶¹ (Heeks, The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? 2009)

⁶² Ibid

⁶³ Ibid

⁶⁴ (Shah and Shakya 2007)

problems. We do not need a “system that works technically but which fails to make a developmental contribution”.⁶⁵

There are things that must be considered and concluded before implementing information and communication technologies. Does the government have policies in place that allow for the development of the technology and continued support? Is there an infrastructure in place that will support the technology and if not is there funding available that can be used to build the infrastructure? Has the technology been developed that is usable in a developing country that at times has harsh conditions? How can we employ information and communication technologies so as not to overwhelm the population that will be utilizing it? Should we hold workshops or implement technology classes in local schools to teach people how to use technology? In what ways can the technology be best used? Should it be used for pleasure or simple communication methods between each other? Or should it be a technology like the iPhone that has many uses for work and play?

If we can answer the former questions and implement the technology successfully then we can move on to bigger and more complicated questions that will give the poor an opportunity to be more like the western world. How can we create a country where the poor are able to create their own digital information and applications? How can they build jobs that are based off of information and communication technologies? Most importantly, how can powerful and developed countries interact and help build wealth for the innovators of these products in poor nations?

⁶⁵ (Heeks, The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? 2009)

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This paper looks at the internationalizing of businesses in developing countries. Third World Nationals are examined by the author as well as technology.