Motivation for Computers in Developing Countries

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Abstract - The digital divide is increasing, that is something we cannot deny. With the release of every new gadget, the gap between those with access to technology and those without is becoming larger. However, is this really an issue? Is technological access linked to developing a country’s economy, society, and overall living conditions? There are some project initiatives in place to answer these questions, but is simply providing computers to a developing country enough to deal with the problem of the digital divide? In most cases, a lot of factors are present in determining the effectiveness of computers in a developing society, such as whether they will be paid for, utilized, or even wanted by the underdeveloped population. In order to properly integrate technology into a disadvantaged society, one must first consider the cultural needs, overall cost, and level of acceptance amongst the population in question. This paper addresses the needs and considerations for a project to succeed, as well as the motivation behind addressing the increasing digital divide.

Index Terms – Computers and society, developing countries, digital divide, digital education

BACKGROUND AND MOTIVATION

Peter Benjamin, a researcher in introducing computers to developing countries, comments on the growing digital divide by saying, “Providing access to technology is necessary if the “digital divide” is not to increase, condemning the majority to increased marginalization in the Information Age” [1]. The motivation discussed in this quote behind seeking technology solutions in developing countries lies in evening out the statuses of these societies in comparison to those of the world’s leading nations. But what differentiates the statuses of the two? While the term “developing country” has no clear definition, the World Bank uses GNI, or gross national income, per capita to develop a scale of incomes, where a GNI per capita of less than $12,736 classifies a nation as a developing country. Incidentally, the United States as of 2015 has a GNI per capita of $55,200, while developing countries such as South Africa and Kenya, have a GNI per capita of $6,800 and $1,290, respectively [2]. Of course, there is an enormous gap between the gross national income per capita of these three countries. What accounts for the large differences between them and what is preventing the growth of the undeveloped nations? Factors that may hinder the growth of such a nation include prevalent illnesses or diseases, malnutrition, and political instability. On the other hand, methods of stimulating growth and developing a nation include individual human capital, trade policies, investment, and education [3]. When looking at these individual cases for growth, do computers have a direct effect? How do computers aid in a country’s trade policies, or the education of a population?

COMPUTERS IN EDUCATION TO IMPROVE STATUS

Computers in today’s educational setting are invaluable to communication, data access, and accessibility in the classroom. First of all, computers in the classroom can assist in catering to several different learning styles. Some of the primary learning styles include visual, aural, read/write, and kinesthetic, all of which can be addressed using the aid of various hardware and software [8]. Specifically, tablets with touch screen interfaces may prove beneficial to a kinesthetic learner by providing hands-on activities and modeling. A visual learner could benefit from videos and pictures provided by a computer program while a read/write learner may prefer an e-textbook or the countless essays and dictionary websites available online. Another benefit of computers in education is that they can assist with the translation of pre-developed learning materials into the native language of a country in need. This way, curriculums can be developed in any language and translated with the help of software to reach a larger audience, instead of requiring a specialist of the language, which may be in limited availability, to write the curriculum. Additionally, computers allow for the broadcast of lectures and informative videos from around the world to be delivered to whomever has internet access. Introducing computers with internet connection at large within a society allows for instant access to countless sources of information, readily available for the population to study. Finally, improvements in accessibility allows those with disabilities to gain access to education and training through a computer. This could lead to new opportunities, contribution, and potential for the disadvantaged.

Improvements in education for a society is of vital importance to its economy. With proper education, research and development initiatives can set in motion the production of trade commodities while entrepreneurship can be encouraged through instruction in business and economics. Increasing self-sustaining businesses and products for export
can cause improved economy in a nation due to a flow of capital; education is an important step in this direction.

**EXAMPLE INITIATIVES**

In the early 2000s, a project by Infonomics South Africa to introduce computers to Cape Town, South Africa began after the Cape Town Council realized the potential of widespread internet access. They believed that such access would create much needed jobs in their city. The project initially introduced thirty-six computers in six public libraries in disadvantaged areas. Each library had four computers dedicated for public use, while the others were specifically intended for the librarians or other private use. The goals of the project were to provide free public access to computers and the internet, prove that open source software is affordable and appropriate, and increase opportunities for the members of disadvantaged communities [3]. The success of this project can be measured in its growth. At the present, twenty of these computer centers have been established around the Western Cape, each equipped with training centers. These facilities offer free internet access, email accounts, and electronic transacting opportunities for banking and shopping online. Overall, the project by Infonomics South Africa successfully established and supported the installation of numerous centers offering computer access to the disadvantaged populations in Cape Town, South Africa [3]. The project proved successful because of its training initiatives for those managing the centers, the local government support of the project, and the inexpensive access for the local population (since usage is free). The initial expenses for providing the computers even went under budget because of the donation of a lot of the requested hardware [3].

Even though their focus is not on computers specifically, introducing rugged and portable technology is Lifeline Energy’s goal. Founded in 1998, this company develops and distributes windup and solar powered media players. Their primary target is providing education to Dadaab refugee camps and markets in Zambia, delivering radio broadcasts on women’s rights and children’s primary education. Their idea caught the attention of famous actor Tom Hanks, a major funder and supporter of the project. Overall, Lifeline delivers an impact of providing information to developing nations in a both unique and effective way [5].

Another more modern approach to introducing computers to developing countries is with the BRCK project. BRCK is a Kickstarter-funded project that provides internet similarly to how a cell phone connects to 3G or 4G networks. With a versatile and rugged exterior, the device can survive in some very harsh conditions, also boasting wireless and battery-operation. Additionally, it can support up to 50 simultaneous devices [4]. The company’s education initiative, known as BRCK Education Solutions, delivers a product called the Kio Kit, which is designed and engineered locally in Kenya. Their vision is “To enable millions of children in schools across emerging markets to access digital educational tools for better learning” [4]. The development of the Kio Kit definitely provides a step towards the realization of this vision. The whole package pairs a charging case fitted with a BRCK internet access device with 50 Kio tablet PCs. The idea behind this is to allow a classroom to distribute the tablets to each student and provide internet access to each device [4]. An example of an initiative to provide a Kio Kit to a facility is demonstrated when BRCK recently delivered a unit to a Kenya national library location in Wajir, a town in Kenya with a population of over 90,000. Interestingly, the youth openly and eagerly embraced the technology, and those unsure were initially curious about it. The director of this particular project noted that they were aware of several cultural biases when observing the integration of the Kio Kit into the learning environment present at the library in Wajir. They noted that despite these obstacles, the visual and auditory methods of learning accompanying the Kio Kit outperform traditional pen and paper methods in most cases, and makes sense in still prevalent African traditions of dancing, music, and narrative [4].

All of these solutions seek to provide technological access to disadvantaged communities, or places that typically do not have access. The Cape Town project focused more on a free service for the community while the Kio Kit centered on education solutions for the classroom. The Lifeline technology focuses on education in unconventional locations, such as refugee camps, without ready access to electricity. The project in Cape Town boasted results of increased computer usage and continued development and support within the community while the Kio Kit initiative in Wajir observed opportunities for increased learning experiences due to cultural focus and appropriations.

**HOW COMPUTERS COULD CAUSE CHANGE**

The United States is now a developed country, and has been that way for a while, but what caused the nation to thrive and develop over the past several hundred years? The Industrial Revolution certainly helped, when many cities across the country embraced production lines, favoring a more streamlined approach to manufacturing. Trade policies, including imports and exports, have also assisted to a high degree. However, one of the most important research developments of innovation in the history of United States has been the computer, or computing device. In the 1980s, the GNI per capita, according to the World Bank’s archives, was just over $15,000, which does categorize the nation as developed and high income. However, in the following 30 years, that number more than tripled to reach its current value of over $55,000. This significant increase correlates to the popularization of computers in the hands of consumers. According to a publication of government census data from the early 2000s, in 1985, only eight percent of households reported computers in their homes, and the internet was not publically available at that time. In 2000, that number reached over fifty percent, with forty-one percent internet access within the home [6]. This statistic shows the popularization of computers in homes over time; so, could the increase in widespread computer use and internet access lead to a higher GNI per capita? What do computers offer a society?
To answer this, we can look at what a computer can accomplish. Computers, along with an internet connection, provide near-instant access to countless sources of information, offering an expanse of knowledge far beyond the extent of what a dictionary can offer. Additionally, computers offer animations, videos, and interactivity for educational purposes, making learning much more effective to visual and interactive learners than traditional lecture settings. Also, beyond learning and educational benefits, communication across the entire world is easier than ever, putting the user in touch with relatives, business opportunities, or political discussions. With access to all these and more, the society integrated with computers and technology has the ability to better educate, trade, and improve personal capital, encompassing all of the opportunities for a developing country to improve GNI per capita and become developed. However, even if computers offer all these benefits, there are still boundaries for introducing them into developing societies.

**DISADVANTAGES TO INTRODUCING COMPUTERS**

There are several scenarios to consider before attempting to introduce computers into an undeveloped country. First and most importantly, are the computers needed? This initial question encompasses cultural situations where the society may refuse computer access altogether, immediately making the project meaningless. Another question to consider is whether the computers will be appropriately utilized. If the citizens are improperly motivated or unwilling to adapt to a new technological lifestyle, the project will most likely be unsuccessful and wasteful. Of additional importance is the evaluation of the costs of upkeep, electricity, training, hardware, and software. All of these factors lead to a high budget in terms of time and money, especially if electricity is insufficient in the target area. Either a source of hardware donation or a budget for new hardware will be a necessary factor to consider, and may consume a lot of time and effort of the team. Finding the appropriate software is also necessary, and time and expenses may need to be dedicated to the creation of the software; on the other hand, in some situations, free and readily available software might be the best fit. Proper training and local maintenance is also needed, which requires active participation from the locals in order to ensure new generations of trained individuals and full societal cooperation and engagement [3].

Alongside questions specific to developing countries is the question of whether computers can provide too many distractions, once proper utilization is initiated. Distractions mostly arise from increased exposure to social media and addicting sources of entertainment, such as streaming sites, articles, and discussion forums [9]. While these sites are sometimes beneficial for communication and restrained entertainment, users can often get carried away, draining countless hours that could have been potentially productive into simply watching and commenting on seemingly useless sources of information. Additionally, social media sites can lead to the development of a false identity, a desire for creating dishonest perfection. Communication across devices offers a wall of protection from physical confrontation, leading to the occasional tendencies of what is known as cyberbullying without foreseeable consequences. This could be developmentally detrimental to the younger members of a developing society.

One more aspect to consider when introducing computers to a developing country is the aspect of foreign forcefulness. Many of disadvantaged countries, especially in Africa, have been subject to foreign manipulation, mainly in the form of colonization [7]. Making sure the locals are open to these ideals of technology being presented by foreigners is of vital importance in consideration of launching the initiative.

With all these disadvantages available when introducing computers to a society, the team behind the project must consider ways in which to confront them, or whether the benefits outweigh the negative outcomes. Therein lies the major issue in project success.

**NEEDS TO SUCCEED**

In order for a project to succeed in introducing computers into a developing society, the team behind the project must evaluate several situational aspects. First, they must assess the needs of the community, focusing mostly on how computer access could improve the lives of those living in the target society. For example, if the society in question is primarily nomadic, heavy, powerful desktops will hinder that society’s movement to new locations where items such as the Kio Kit discussed earlier may prove much more beneficial. Another key insight is the affordability of the users. Will the society be able to pay for continued utilization and upkeep of the technology introduced, or will the project fade away as expenses for continuation increase? The hardware and software expenses must also be evaluated. Will the society need powerful stationary desktops or lightweight, affordable tablets? Is there a need for servers and cloud storage? Will the hardware be obtained using specific manufacturers, or will it be mostly donated from recycled computers? How fast or efficient do the machines have to be? These questions will definitely differ on a situational basis. Local and political support is of utmost importance, because if the vocal majority of the society is against the introduction of computers, the initiative will catch little to no momentum. In addition to support, participation must also be considered; without high levels of involvement, the project will be highly susceptible to failure. The Smart Cape Access project proved successful primarily because of the support of the local government and the high amounts of participation amongst the population [3]. Finally, the team must consider the relevant content if the situation is related to education, with a primary focus on the cultural learning styles of the population. They should involve the language, culture, and upbringing of those to whom they are providing education materials, and decide whether the curriculum is appropriate for its audience integrating with the technology, just as BRCK Education did in Wajir, Kenya [4]. For example, teaching United States History to a group of children in South Africa is not the most efficient way to utilize time and effort in their education. Evaluating the needs for a
project’s success is an ever changing process, with new questions and solutions arising each year.

A LOOK AT THE FUTURE

With continued developmental trends, the future of inexpensive technology solutions will be more powerful than ever. Recent efforts have produced faster and more reliable portable computers and touch screen devices at a much lower cost. In the past, portability usually meant sacrificing speed, efficiency, money, and processing power. However, while this sacrifice is still true, it is much less of an issue with current technology. Especially evident with solutions such as the Kio Kit, tablet technology and portability is consistently improving. Such a package would not have been remotely affordable or even developmentally possible over a decade ago.

Another consideration for the future is recycling the current generation of computers. As hardware shifts into more powerful and readily available architecture and prepares for virtual reality integration, older components will be discarded. Upgrading sometimes occurs on a yearly basis in some circumstances; instead of throwing out older hardware, centers could advertise for the disposal of working computers or components and focus on preparing recycled machines for use in worldwide projects. While many initiatives of e-recycling are already in place, they could be a lot more effective in terms of advertising, effectiveness, and vision.

The question of divide to be considered in the future still prominently exists; with virtual reality almost a mainstream concept, where do we begin to educate developing societies without even the simplest of computer knowledge? Is there even room for new countries to step up and enter the economy through technological development, or are the other countries simply too far ahead? Bridging the digital divide will be one of the biggest challenges the world has faced, but leaving behind a large majority of humanity to live in poverty, political unrest, disease, and uncertainty makes the effort in overcoming such a hurdle worth it in the end. While technology continues to evolve and grow, so will the projects of introducing computers to disadvantaged nations, offering new methods of portability and innovation to distribute for education, communication, employment, business, and individual capital improvement.

SUMMARY AND CONCLUSION

The digital divide, greatly distancing the developed nations of the world from the underdeveloped through technological innovation and utilization, is a serious issue that must be addressed. The introduction of computers into a society can assist in bettering education, communication, and overall improved personal capital. Computers cater to many different learning styles, making them of vital importance to almost any educational situation. However, there is no single solution or clear cut method for introducing computers to all disadvantaged nations. Each society requires its own evaluation of what technology is desirable or most effective. Even with the advantages of a society having access to computers, there are many disadvantages that may cause the introduction of such technology to be undesired. Hindrances such as cost of upkeep, reliance on computers, cyber-crime, cyberbullying, cultural change, social media distraction, and online presence obsession may be enough for a local body to shut down any project before it even begins. In order to succeed, a project team must shift primary focus to evaluating the society’s situation, their primary needs, and their resources available. Training initiatives must be in place for the project to continue beyond the initial launch, and high levels of participation amongst the population is necessary. Cultural biases must be noted and accounted for; sometimes, the technology caters to these biases through different learning style opportunities. With price being another major barrier to success, continued trends in technological development are resulting in cheaper and more effective solutions, such as more powerful and lightweight tablet PCs. Moreover, stronger and faster hardware is becoming less expensive as the newest gadgets targeted at developed nations are released, allowing those with the ability to upgrade their systems to recycle their unused computers and components for future use in worldwide projects. This provides a relatively inexpensive method of obtaining the hardware with effective speeds and processing power, so that even underdeveloped societies are not entirely limited by architecture. Overall, with the digital divide growing with every new technological innovation, the need to assist the left behind developing countries also grows.

REFERENCES