Towards an Understanding of Implementation and Benefits of ICT in Education: Review of Issues to be Considered by Developing Countries.

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Abstract: In recent years, information and communication technologies (ICT) have expanded at an astonishing rate. The public and private sectors increasingly depend on ICT capabilities and services. The aim of this paper is to report on the ongoing research to develop an understanding on the implementation and impact of ICT in Education, Case study of developing countries-south East Asia. The study will include a review of current studies world-wide. The case study will be based on past experiences of implementation of ICT in Education outcomes, interruptions or losses owing to a lack of, or installation of ineffective or effective, ICT tools.

Keywords: ICT, education, developing countries

THE NECESSITY OF IMPLEMENTING ICT IN EDUCATION: LEARNING FROM OTHER RESEARCHERS

Information and communication technologies (ICT), have been playing their crucial roles in many areas of the society, especially in education fields as discussed in numerous prior and current researches. Specifically, ICT's educational uses are clearly perceived and welcomed by learners and educators as benefits and satisfactions from successful implementations of ICT tools. In regards to benefits of ICT implementations in education, from a vast number of prior and current studies it can be determined that those benefits fall mostly in 3 respective categories: *learning community, accessibility* and *adopters' developments.*

As perceived by the researchers, the learning environment consists of the *learning community*, which is formed by educators and learners as well as how they interact with each other and various aspects affecting their interactions, gains access to resources in *physical space* with facilities supporting the learning process and affected by time constraints while influencing the development of the participants. By having these characteristics and constraints of limited space and time, scholars have been trying to maximize the effectiveness of the learning process by suggesting various models of e-learning which are believed to have the abilities to overcome those constraints while improving the learning community. The importance of learning communities has been discussed in many papers and especially emphasized by Harris (2007)[4] via her interpretation of Vygotsky's concept (1978) about the role of social interaction, which occurs within learning communities, in the learning process. In addition, Harris (2007)[4] also mentions the Zones of Proximal Development (ZPD) in her thesis which continues to discuss Vygotsky's emphasis on how learning communities ensure better learning environment by arguing that people, as peers who have equal or higher capabilities in sharing knowledge, learn better when they have discussions to extract ideas from each other.

A survey conducted in 2003 which is mentioned in Kirkup and Kirkwood's work illustrates 70% of tutors acknowledged the high improvements brought by ICT adoption in terms of quality of responding to students' queries. Significantly, 75% of respondents performing administrative tasks also found quality of interaction had also been enhanced [14] thanks to the uses of ICT tools such as telephone and e-mail contacts. In another study to investigate the uses of Facebook as an ICT tool by Bosch (2009)[2], the author stated the point view of one lecturer about how she found communicating to people using Facebook is easier than looking for those people in classroom. Additionally, Zaneldin (2010)[26] commented that online forums and discussion boards, as tools of ICT adoption in education, empower the learners to socialize and learn together online by allowing them to communicate with their educators and peers.

It is foremost necessary to discuss the psychological behaviours of learners for they are considered as the key stakeholder of most ICT implementation projects. Interestingly, some papers mention how e-learning can help students to eliminate the discomfort of public speaking which prevents them from openly raising their ideas among peers and educators. To illustrate, Bosch (2009)[2] highlights a lecturer's response about how Facebook "allows students to ask questions they might not feel comfortable asking in class" which relates to a sense of anonymity when it lacks face-to-face interactions. Supporting this opinion, Moody (2010)[16] states that shy students who find it difficult talking in front of their peers may "open up on the Web." On the other hand, e-learning provides the capability of arranging thoughts by writing them beforehand so that proactive learners can freely participate in class dialogue, continued by Moody (2010) [16]. Another study by Kosik (2007) as mentioned in Bosch's (2009) work[2], argues that Pennsylvania State University's students who use Facebook showed few reservations to post content on the Internet. In particular, the purposes of those students who utilize Facebook are indicated as academic as they appreciate the immediate responses rate that helps them to retrieve information from classmates about assignments (Kosik, 2007).

Another concern of online learning communities is to ensure that high quality content is delivered to the participants. In regards to this aspect, many studies have exploited the attributes

and functions of e-learning to prove its effectiveness not only in helping educators to manage the online content well but also assist learners to absorb knowledge better. Specifically, by relying on just-in-time basis of electronic access concept proposed by Shepherd (2002) in Singth's (2011)[22] paper, information and knowledge is packaged in smaller and more manageable chunks which allows learners to browse relevant parts of the courses to their needs only or even redo the trainings if required. Moreover, Singth (2011) [22] also discusses the benefits of 'uniformity' and 'controllability' offered by e-learning. Traditional classrooms where the differences in instructors' teaching methods that may lead to the problem of inconsistent courses' content can now be resolved by the uniformity of online content for "e-learning provides same quality and content of training to all the individuals." In terms of controllability, learners who are unable to catch up with others' learning paces now can pick their own pace that fits most with their abilities.

The other important area of the learning environment is *Accessibility* which allows educators and learners to gain access to the learning resources. Ideally, it is crucial to ensure that a learning environment always gain timely and efficient access to its most achievable rich materials so that participants can utilize them well for their studies. Nevertheless, with the traditional model that is too much dependent on the rigid, limited space and time, the effectiveness of the learning process will also be hampered [22]. The physical space consists of distances between places as well as their sizes which are required by educators and learners to conduct educational activities such as schools, classrooms... etc. Apart from the geographical distances, which limit the interactions of peers from different communities across countries and continents, that are considered to be one of the most rigid attributes to be modified, there are few options to achieve the optimum sizes of educational facilities to ensure the capability of delivering the most effective learning experiences to learners. Fortunately, e-learning or adoption of ICT in education provides a viable solution to cope with the space constraints. Marriott et al. (2004) [15] indicates that higher education may utilize the Internet to promote the international co-operation and share viewpoints across boundaries. The listed benefits of web-based learning, which is mentioned in Zaneldin's work (2010) [26], also highlights that the participants of learning communities do not have to meet in order to conduct the courses. Instead, an investigation on university in the United Arab Emirates showed that an educational system called Blackboard is implemented to provide access to course materials from anywhere so that students are no longer required to attend classes while instructors can post announcements and responses quickly in the same manner [26]. While the above evidences prove e-learning's abilities in overcoming the space difficulties, the researchers could also see the link to solutions in terms of time constraints. To illustrate, Singth (2011)[22] provides thoughtful insights about how learners can reduce or even eliminate the wasted travel time which can be spent effectively for other activities for they do not necessarily travel from places to places to participate in trainings.

CURRENT SITUATION IN DEVELOPING COUNTRIES: REASONS BEHIND NOT BEING ADOPTED OR ADOPTED INEFFICIENTLY.

Rajesh (2003) [19] pointed out that economic is one of the critical difficulties that prevent developing countries to implement ICT in education. These countries often have financial disadvantage and cannot afford such a huge investment in ICTs' technology. Without financial support, ICT's infrastructure will not be able to grow and play its role as backbone to improve the learning environment. Jayson Richardson (2010)[8] also mentioned about this issue in the case study of Cambodia, where institutes required more computers and power supply in order to organize effective ICT courses. Consequently, when it comes with money pressure and stress of changing, the alternative will face high chance of being rejected.

Based on a survey by Yalin, Karadeniz and Sahin (2007) [25], nearly 80% of principals and teachers claimed that lacking of training and supporting hardware is a barrier to implementating ICT in their schools. Lacking backbone support also cause bad impression which can increase chance of being discontinued. Jayson Richardson (2011)[9] stated that power instability affected ability to observe, use or practice ICT skills, as well as fluctuation due to losing unsaved data. For that reason, usefulness and benefit of using ICT tools were hindered. Moreover, it can be seen that institutes will purchase used/old computers and tools under financial burden. Performing tasks with outdated computer may not be a pleasure experience for trainees. Their abilities and free of use will be restricted by slow processing capacity or unstable computer. Therefore, they may lose interest on the technology and drop the training. Furthermore, due to unbalancing between number of trainees and technical tools, people will have less opportunity to practice and apply ICT skills in their training. Consequently, after the training, learner may have basic knowledge and ICT skills but still cannot confidently use the tools [10].

English is also an issue for people in developing countries to obtain ICT knowledge. For countries where ICT is an extremely a new concept, ICT documentation will be hardly available in their native language. This impeded accessibility of citizen toward ICT since only those who know English and have interest in ICT can access these document. The issue will become more critical in East Asia because people care more about traditional self-esteem and culture which limit their willing to adopt new language. Moreover, differences in basic tongue, character symbols and speaking style are also obstacles for one to learn English, hence prevent him/her from adopting ICT knowledge. A study in Cambodia by Jayson Richardson (2011) [9] proved that one can rejected or refused ICT adoption due to lack of ability to speak English.

Finally, it is realized that learners in ICT implementation program are usually trained with basic skills for example manipulating word document or PowerPoint slides. Although these skills are useful, spending huge investment to acquire them is perceived ineffective. As reported in a case of Vietnam, teachers usually use ICT tools to replace their traditional practice such as preparing teaching documents or presentations. 65.3% of them never or rarely use email for contacting purpose [10].

WHAT SHOULD DEVELOPING COUNTRIES DO TO OVERCOME THESE DIFFICULTIES?

In order to overcome difficulty and implement ICT in education more effective, fewer developing countries are recommended to review and learn from success stories of countries who adopted ICT. It is observed that in most cases, hosting countries had to concentrate their funding resources to technical institutions. In

1990s, Singapore assigned 25% of its budget to technical education targeting to increase high-tech skills. The proposed move was intended for "both local and foreign organizations to recruit overseas professionals with critical ICT skills" [3]. Similarly, China decided to help more than 90% of its schools to reach Internet connection and gain accessing to ICT knowledge bases. In this ambitious project, faculties in mountainous or isolated areas were able to receive information using "Education Satellite Bandwidth Network." [27].

Not only successful stories, but also failure or inefficient aspects of the implementation must be considered. Although Singapore has met its high goal of restructuring manpower and improve level of national ICT skills, it failed to stabilise the workforce "harmony". Since many technology institutes and centres were established and people were encouraged to study as well as work in ICT fields, one will easily realize that they must have good ICT skills in order to gain higher positions in ICT society. As a result, Singapore experienced "an imbalanced development of low and medium skills" of ICT [3].

Young generation can also be trained as first adopters to impulse ICT enhancement. One of technology's attributes is "frequently change". As information and ICT knowledge are changing every time, one needs to be proactive and adaptable. Jayson Richardson (2009)[7]commented that "Younger and more experienced teacher trainers tended to agree more with the ability to find advantages of using the ICT skills than did older, less experienced teacher trainers." Young generation tends to understand computer and communication tools easier because they grow with that technology.

Oye, Salleh & Iahad (2011) [17] mentioned that low awareness and computer understanding level are critical factors that impact e-learning's acceptance in lecturers and students community of Nigerian. Therefore, providing training and support in ICT usage and implementation will play an important role in the adoption of that technology in education. The sooner people get used to the tools and idea of ICT, the easier they can acquire skills and abilities using it.

WHAT ARE THE EFFECTS OF ICT IN EDUCATION NOT BEING ADOPTED?

ICT not only offers tools to support education, it continues to play important role in many other aspects of learning. Companies are now dealing with customer's request using email, Customer Relationship Management (CRM) system etc. Banks are now managing clients' financial transaction using information systems. They are also dealing with higher risk of cyber-crimes. Hence, organizations will need advanced technical equipment to operate more efficiently and gain competitive advantage. For that reason, failing to bring ICT knowledge into education will prevent citizen from getting enough ICT skills to become valuable work force in society. Consequently, high-tech companies or foreign invested organization cannot be established within the nation. Therefore, country economy's health will be affected.

In present, ICT is considered "one of the basic building blocks of modern society" [13]. It is a flow of change which impacts many aspects of the civilization. Either authorities accept this flow of information or deny it, ICT will affect their society. Without help of ICT in education, students will have less experience and awareness about ICT. Moreover, lack of knowledge about ICT and its powers can also lead to cybercrime. With the help of the Internet "people without technical training or knowledge, but with the opportunity to commit the crime" can possibly cause cybercrime by reading instruction on negative sites, [11]. Sometimes, even the criminals cannot realize that they are committing crime because they simply do not know about it. For that reason, it is necessary to educate citizens about ICT and its capabilities. Jo Tondeuretl, (2006) [12] also described rationale of ICT in education is to guide students and young generation "to become responsible and well-informed citizens". The idea was supported in article about role of ICT in education sector by Saverinus Kaka (2008)[21]. He comments that facing temptation of online games as well as negative and porn websites, students who lack ICT awareness, will easily be addicted and spend less time on studying [21].

National capacity is another aspect that will be affected due to ICT adopting failure. Jayson Richardson (2010) [8]warned that if a nation cannot achieve ICT adoption effectively it can "fall further behind its neighbours, and its young people will lack the skills they need for life in the digital age." In modern era, businesses are built and destroyed in the hand of information For example, when it comes to foreign investment, a nation with high technical support and skilful workforce will be more attractive than those are not. Furthermore, countries which have low ICT technology may meet difficulties to establish or conduct advanced research projects. Hence, it will remain slower and gain more disadvantages than its neighbours.

SYNTHESIS AND THE WAY FORWARD

Richardson (2009) [7] noted that Pelgrum (2001)[18] found that teachers often had a lack of knowledge and skills about ICTs and thus had difficulty integrating them in instruction. This research paper noted that support is always paramount in successful implementation of ICT in education. Since a large number of teachers are not comfortable in using ICT in their curriculum, timely support and guidance will help them overcome this problem.

Tiene concluded that "one critical mistake is to be overly ambitious and overly optimistic about what technology can accomplish" (2004, 90)[23]. This research paper recommends governments and educational institutions to be realistic and aim at achievable objectives during their planning for ICT introduction in a learning environment. Research has shown that unachievable objectives will not only frustrate the teachers but also will be expansive during the execution phase. As we are considering introducing ICT in education, we must also consider alternatives or contingency plan if we are going to face any hurdles. One good example here can be the introduction of BlackBoard (BB) as an online repository. During the planning process we should try as much as we can to get in touch with BB support team to establish if our requirements will be met.

Jayson Richardson (2009)[7] stated that "as less developed nations attempt to close their digital divide and shift to participate in the knowledge and innovation economy, international development project managers and international development policy makers would be served by gaining an understanding of both the motivators and inhibitors to adopting the use of information and communication technologies (ICTs). To better facilitate sustainability, scalability, and spread of technological innovations in less developed nations, there is a need to better understand why stakeholders choose to adopt or not adopt these innovations". It is always important for less developed nations to understand the need for ICT investment. As this research paper pointed out, with the pressure of investment comes comes rushed decisions and lack of support towards ICT adopters. This concept leads to low rate of ICT implementation in Education sector.

Afele (2003) [1] and Wilson (2004) [24] posited this understanding under the umbrella of peace, security, and prosperity. Afele stated that ICTs can empower local groups by allowing marginalized communities to contribute to "global knowledge and foster global peace and security" (p. 5). Afele claimed that processing and using information to create knowledge, share lessons learned, and innovate at the local level can give marginalized societies opportunities to become empowered and to contribute to the "wealth of global knowledge" thus fostering peace and security (p. 5). Wilson (2004) [24] supported this claim by linking marginalization at the local level with conflicts of politics, economics, nationalism, and even terrorism. The researchers support this quote with reference to current situation in developing countries. Students in less developed countries are eager to adopt and use ICT as part of their learning experience; hence Government and other organization can take advantage of this and invest in ICT in Education.

ICT in Education implementation is not an easy task. As indicated in the literature review and other section. The biggest stumbling block developing nations face in the implementation of ICT in education is the lack of perceived need for incorporating ICT in education. With the huge investment involved and the fear of the project to fail, many developing countries are discouraged in the endeavour to implement ICT in Education. Wilson (2004)[24] found it is important to understand and address how ICT innovations are diffused at the local level to avoid repeating mistakes of the past. "Leaders who fail to seize ICT opportunities may produce the same results as leaders who failed to build factories or railroads in the early stages of the industrial revolution" (p. 5). Jayson Richards(2009)[7] also noted that the United Nations Development Programme (2001) claimed that "today's technological transformations hinge on each country's ability to unleash the creativity of its people, enabling them to master technology, to innovate and to adapt technology to their own needs and opportunities" (p. 79). Therefore, for future prosperity it is important that researchers, program managers, and international policy makers achieve a greater understanding of what motivates and what inhibits end users' choice to adopt ICT innovations in less developed nations."

One of the main interesting observation reported on Jayson Richardson (2009) [7] was "Teacher trainers in the study were more motivated to adopt the ICT skills if they thought use of these skills was mandated, increased their reputation, was compatible with the demands of their current job, was compatible with how they liked to get things done, was easy, if they could see tangible results, if they saw others using the skills, and if they were given opportunities to practice using the skills. This research paper recommends developing nations and education institutions involved in the implementation of ICT to involve all the stake holders in decision making towards ICT implementation in Education systems. This will reduce the problems encountered in the Jayson study and try to increase the participation and implementation of the ICT in education by all concerned parties.

Rogers (2003) [20] wrote that scholars who focus their research on the diffusion of innovations have traditionally attempted to answer how different types of adopters differ from one another. Gaining accurate information about how to increase the adoption of innovations is critical to all fields of study, but is tantamount to the field of international development. In particular, this knowledge is highly germane in planning and creating appropriate, cost-effective, sustainable technology training initiatives in less-developed nations. Hornik (2004)[5] detailed that 'any researcher (or practitioner trying to intervene to increase adoption of a new behaviour) needs to begin by considering what are all the potential explanations for the current pattern of behaviour might be, before he or she begins to formulate an intervention path' (p. 144)[5]. As indicated in the developing nations, that funding is a big problem, government and education institution should look at cost effective means of implementing ICT in education avoid huge set back during the implementation process. One way of avoid the huge implementation cost is training. Training will improve the morale and confidence of the teachers. The researchers highly recommend hands on training. Although training can be viewed as increasing cost from other quarters, research has proved that proper training will reduce the project cost on the long run. Jayson (2009) [7] Understanding why certain groups chose to adopt the use of the ICT skills is imperative as future non-governmental, inter-governmental and governmental organisations develop further technology training programs.

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