FROM FUNDAMENTALISTS TO STRUCTURALISTS: BRIDGING THE DIGITAL DIVIDE

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ABSTRACT

The purpose of this literature review is to provide information about several ICT initiatives undertaken in education on a global basis in order to overcome the digital divide and summarise the findings of these initiatives. Due to the limited scope of the study, the bulk of the review mainly concerns initiatives undertaken in secondary schools, through general information regarding other areas of digital development which have been included where relevant.

Keywords: Digital Divide, e-learning, ICT, Development, Schools, Computers.

INTRODUCTION

This literature review examines the global digital divide and is focused on the ICT initiatives in secondary education in developing countries from 1990 onwards.

The purpose of this review is not to focus on every aspect of the global digital divide because that is a huge undertaking on its own. The intention is to highlight some useful references that are relevant in addressing how ICTs can be used in educational context.

Because of the broad topic, the paper focuses on initiatives undertaken in secondary education in developing countries while omitting reference to other aspects of digital divide such as lack of infrastructure, social exclusion or democratic divide. Consequently, this literature survey will consider three major initiatives regarding ICT in developing countries in addition to providing a general framework of the digital divide.

Structure of Literature Review

This literature begins with a description and definition of the digital divide. The paper then provides a theoretical framework and organizes the results of the literature review for the related topic into the following sections (It should be noted that some of these sections have been adopted from a framework used in a similar study by Trujillo (2000)):

- Descriptive case studies
- National policies
- Country comparisons and
- Empirical studies

One should bear in mind that the lists provided in each of the categories include both books and online resources and they are not exhaustive. Besides, some of the studies have been mentioned in more than one category since the categories are overlapping to a certain extent.

Search Strategy

Most of the literature for this review has been found on the Internet via the search engine 'Google' that has enabled many recent studies to be sourced. These online sources include published or unpublished papers, working papers, conference proceedings, dissertations, reviews and surveys related to digital divide and education.

In addition, a search of relevant databases has been conducted including ERIC (United States), International ERIC (Australian and British education indexes), and the British education indexes. Even though most of the academic literature has been found in American or British journals, a special effort has been made to include literature from the developing world, as well as non-Western views of development (Hawkridge, Jaworski, McMahon, 1990).

The library searches have been conducted initially including the keyword "digital divide". Besides, a "snowball" technique has been used starting with the main reference textbooks related to the digital divide, following citations to journals.

Due to the fact that empirical work over time on the effects of ICTs on education in developing countries is modest (Trujillo, 2000), this literature review has included searches in

a broader spectrum of sources than just academic published journals. Thus, search for relevant studies have also included manual searches and review of the available hard-copy books.

It must be taken into consideration that in the absence of any agreed-upon keywords and descriptors for the reports located on the Internet, it is likely that some literature has been overlooked.

Defining the Digital Divide

The term digital divide was first coined by Lloyd Morrisett, president of the Markle Foundation (Hoffman, et al., 2001). According to Hoffman et al., Morrisett[1] vaguely conceived of a divide between the information-haves and have-nots. While Morrisett is credited with the term, the coupling of ICT and inequality is not new. This belief is also evident in Compaine's (2001) claim that: "Before there was a 'digital divide' there were the 'information haves and the have-nots." (Compaine, 2001, p. 3).

The marked gap between the number of countries that are high-level ICT participants and the number that are low-level ICT participants has been referred to as the global digital divide (World Economic Forum, 2000). So, an uneven pattern or gap of ICT diffusion between industrialized countries and least developed countries exists as measured by the number of phone lines per inhabitants (teledensity), the number of Internet hosts, the number of Internet users, the number of households that own computers, and the number of cell and mobile phone users (Campbell, 2001).

The global digital divide, as well as the digital divide within countries, is also referred to as the 'technological divide' or 'the lack of digital inclusion' (Rice, 2001).

In a similar vein, according to an ITU (2002) report, the digital divide is not only defined in terms of lack of access to telephone services, but also in terms of lack of access to ICT.

OECD (OECD, 2001) roughly frames the digital divide as: "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access ICT and to their use of the Internet for wide variety of activities." So, the digital divide reflects various differences among and within countries.

According to Alcántara (2001), the digital divide is an integral part of a much broader and more intractable development divide. People in low-income countries are limited not only by their lack of access to modern means of communication and sources of information, but also by a complex network of constraints ranging from unresolved problems of poverty and injustice in their own societies (Alcántara, 2001).

Moreover, in her book "Digital Divide", Norris (2001) defines the digital divide as a multidimensional phenomenon encompassing three distinct aspects (p.6):

- *Global divide:* This refers to the divergence of Internet access between industrialized and developing societies.
- *Social divide:* This refers to the gap between information rich and poor in each nation.
- *Democratic divide:* This has been described as the difference between those who do and don't use digital resources to engage, mobilize and participate in public life.

In this context, Norris (2001) states that global divide is evident between industrialized and developing societies and a social divide is apparent between rich and poor within each nation.

Similarly, an ITU report (2002) also states that there are many dimensions to the digital divide. The digital divide exists between nations and within nations (ITU, 2002). Similarly, it exists between rich and poor, young and old, urban and rural dwellers (ITU, 2002). Moreover, there is a financial divide, a knowledge divide and a divide of confidence (ITU, 2002). The divide is also reflected in the concentration of information resources in a small group of developed countries – the imbalance of information technology assets among nations (ITU, 2002).

Another classification of the digital divide has been made by Smolenski (2000). Smolenski (2000) defines the following three types of divides: Firstly, there is a divide between those of high and low socio-economic status including minority

[1]Morrisett in Compaine (2001) "The Digital Divide : Facing A Crisis or Creating A Myth ?".

groups and single parents. The second type of divide is due to differences in experience while the third type of divide occurs due to lack of access (Smolenski, 2000). To exemplify, due to a lack of infrastructure people in isolated rural areas might find it difficult to access the Internet.

Similar to Smolenski's (2000) classification, Van Dijk (2003) distinguishes four kinds of barriers to access and the type of access they restrict:

- *Mental access:* This type of access is restricted by a lack of elementary digital experience caused by lack of interest, computer anxiety, and unattractiveness of the new technology.
- *Material access:* This is restricted if there is no possession of computers and network connections.
- *Skills access:* A lack of digital skills caused by insufficient user-friendliness and inadequate education or social support limit skills access.
- *Usage access:* Lack of significant usage opportunities restrict usage access.

In the light of these definitions, there appears to be a converging viewpoint that the digital divide is not just about access to technology, nor necessarily of high cost, but has a socio-economic component (ITU, 2002).

Although it is beyond the scope of this study, it should be noted that the legal, political, and economic circumstances under which a country operates gives some indication of a country's e-ready condition[2]. Therefore, it is claimed that under the right circumstances, ICTs can greatly expand a country's economic growth, create or enhance a country's participation in global markets, dramatically improve human welfare and human capital, and promote political accountability (United Nations Development Programme, 2000).

The Digital Divide in Educational Context

Many parts of the world are undergoing a digital revolution in the area of ICTs (Commission of the European Communities, 2001). Similarly, it has been stated in a United Nations Report (2000, p. 3) that "the world is undergoing a revolution in ICTs that has momentous implications for the current and future social and economic situation of all countries of the world". This report also identifies several important benefits to countries and their populations from the wide application and use of ICTs, including the direct contribution of the ICTs tremendous potential for improving education, including distance learning and training (Rice, 2003).

Furthermore, the OECD (2000) has defined the digital divide for students in three ways:

- *Missing Link:* In remote rural or poor inner-urban areas where telecommunications are limited and/or expensive and for students who have disabilities.
- *Wasteland:* Groups who find the technology isolating and mechanical, for example, females and some minorities.
- *Foreign language:* High poverty homes lacking equipment and language skills.

Furthermore, the following four important factors to bridge the digital divide have been cited in an ITU report: (ITU, 2002):

- *Awareness:* The state and individuals should be fully aware of the importance of digital technologies and their applications.
- *Accessibility:* Infrastructure should be expanded and improved in order to provide the necessary connectivity for effective use of ICTs.
- *Availability:* ICT must be offered within reasonable proximity, with appropriate hardware and software.
- *Affordability:* Means should be found to provide low-cost services to users, low-cost equipment, and training on the effective use of ICTs for national and individual development.

In their article "New Technologies for Literacy and Adult Education: A Global Perspective", Kozma and Wagner (2003) put forward that there are ICT digital divide programs that can widen the divide, by investing in the top end (easier to reach) parts of the spectrum of the disadvantaged population. Thus, it is suggested here that if the UN Decade, which refers to the the years 2003-2012 as proclaimed by the United Nations General Assembly (UN, 2002a) to be the United Nations Literacy Decade, is to succeed, it must also try "to reach the unreached, to reach

[2] InfoDev in United Nations Development Program (2000)

those at the bottom end of the literacy divide, and to pay attention to how ICTs can make a special contribution" (Kozma, Wagner, 2003).

Furthermore, Kozma and Wagner (2003) state that with a set of good principles, a reasonable level of support, and an eye toward innovation, a great deal can be achieved to employ ICTs to help the poorest of the poor – more than has ever been thought possible before. They conclude that even within the poorest population sectors and countries, ICT is now too cheap to ignore since literacy and technology are becoming increasingly inter-dependent (Kozma, Wagner, 2003). Besides, private sector involvement is essential in order to take advantage of the latest ICT tools (Kozma, Wagner, 2003).

Theoretical Lenses

According to Trujillo (2000), regardless of the source, or quality of the study related to the digital divide, one can distinguish different paradigms whose assumptions and characteristics reflect one of the following viewpoints:

From a "structuralist" view, the structure of the social actions, attitudes, and processes determine the use, or non-use of information technology within a society (Trujillo, 2000). On the other hand, Trujillo (2000) notes that the "instrumentalist" approach considers ICTs as a powerful instrument with the ability to act as a catalyst to the "desirable" change in the structure of society. Besides, from each point of view, there is an assumption regarding the positive or negative effects of information technology on a society's development (Trujillo, 2000).

According to Norris (2001), optimists believe in the positivist role of the Internet for transforming poverty in developing societies, while sceptics believe that new technologies alone will make little difference one way or other (p.9). On the other hand, pessimists emphasize that digital technologies will further exacerbate the existing North-South divide (Norris, 2001).

Similarly, Tambo (2003) states that the question of the digital divide is much more to do with national economic performance than with mainstream development objectives and poverty reduction and he broadly defines the following categories:

- "Digital optimists" have argued that ICTs offer developing countries including the LDCs, an opportunity to "leapfrog" stages of technological development and compete in ICT and knowledge areas with industrial countries on more equal terms than they have done in the past.
- On the contrary, "digital pessimists" believe, that digital divides are likely to grow over time as ICTs become increasingly pervasive in industrial countries while most developing countries, particularly LDCs, lack the expertise to follow.

Results of Literature Review

As Adeya (2002) claims, the importance of ICTs and education is a topic that runs across all thematic areas on ICTs and development.

Similarly, Trujillo (2000) argues, the discussion regarding the digital divide has been spurred by the recent availability of official international and national statistics.

Over the last two years, international agencies have produced several reports and published books that described the digital divide. To exemplify, the International Telecommunication Union (ITU) reports on the access indicators of the information society worldwide (ITU, 2003), OECD's studies that review evidence for links between ICT and a country's economic growth (Tambo, 2003) and its published papers regarding the ICT developments in education in LDCs (Kozma, Wagner, 2003); UNESCO's reports about the use of ICT indicators in education (UNESCO, 2003) and European Commission's country reports (European Commission, 2005) regarding the modernization of education include several national statistics.

Trujillo (2000) claims that, "most of these described statistics that stated how access to the Internet ran along the fault lines of national societies, dividing educated from illiterate, men from women, rich from poor, young from old, urban from rural". Monitoring the use of ICTs and the Internet became a priority for those interested in studying the digital divide (Trujillo, 2000).

To quote once more from Trujillo (2000): "A growing scholarly interest in analyzing the impacts of ICTs on

economic, social, and political development among and within countries has not changed the existing modest critical literature review and scarce solid scientific research."

Case Studies

Information regarding the empirical studies on information technology and development were obtained from the web pages of several international organizations such as the World Bank Institute, UN, UNESCO, UNICEF, ITU, EU and OECD that currently fund or carry out development projects with a component from the ICTs.

As Norris (2001) states, these international organizations raised concerns about the growing global digital divide and there is a need to overcome this disparity before the situation rigidifies "into a new virtual Berlin Wall splitting rich and poor worlds".

In this context, OECD produced reports consisting of descriptive case studies such as "Schooling for Tomorrow" (OECD, 2000) that confirm that technologies themselves can be a powerful influence in the educational arena. Moreover, OECD's published papers that present how technology can support the development of both youth and adult literacy (Kozma, Wagner, 2003) include several case studies.

The proceedings from the forums of the UN ICT Task Force that depict the contribution of ICTs to education initiatives (Bracey, 2005); UNESCO's studies regarding the ICT integration into schools (Haddad, Draxler, 2001) and its published books such as Pelgrum and Law's (2003) "ICT in Education Around The World: Trends, Problems and Prospects" can be cited as instrumentalist studies illuminating several case studies.

Another example for case studies has been provided by the authors Hepp, K., Hinostroza, S., Laval, M., Rehbein, F. (2004). They have demonstrated in their study "Technology in Schools: Education, ICT and the Knowledge Society" that introducing ICT into the schools, without a proper staff development plan and without a pedagogical perspective, is a low-return investment.

Regarding the educational ICT initiatives, Hawkins' (2002) paper "Ten Lessons for ICT and Education in the Developing World" published by the World Bank's Institute is worth to mention since the author has provided examples for innovative educational solutions from all around the world.

Moreover, Abbott (2001) claims in his book "ICT: Changing Education" that ICT is changing the notion of what schooling consists of, how it should be delivered and that ICT in the classroom can be seen as part of a continuum dealing with the use of previous forms of instructional technology. For this purpose, he uses several descriptive case studies.

Additionally, Hinostraza, Guzman and Isaacs (2002) show in their case study "Innovative Uses of ICT in Chilean Schools" how a school connected to the Internet can foster communication at local (i.e. inside a community), national and international levels. Hinostraza, Guzman and Isaacs (2002) claim that educational projects such as those using the framework of application of SITES (a worldwide assessment of the use of ICT for learning) that connect students and teachers from different countries might expand students' horizons by allowing them to know and interact with people from other cultures and they can also stimulate group work and social interaction (Hinostraza, Guzman and Isaacs, 2002).

More Insights from A Few Cases

WorldLinks, GeSCI and Enlaces both deserve particular attention because of their extensive experience with ICT in many developing countries around the world (Hinostraza, Guzman and Isaacs, 2002).

World Links

The World Bank Institute launched the World Links for Development, or WorLD, Program in 1997 "to expand access to digital learning resources and address the growing digital divide between the technology haves and have-nots" (Cossa, Cronje, 2004). The aim of the WorLD Program is to link secondary school students and teachers around the world in order to improve education in developing countries and help to develop skills that youths need for obtaining jobs in the 21st century.

The World Program has five components (Kozma, 2002):

- Internet connectivity for secondary schools in developing countries.

- Training in the use of technology to improve teaching and learning.
- School-to-school partnerships, as well as regional and global partnerships with public, private, and non-governmental organizations.
- Telecommunications policy advice for the education sector.
- Monitoring and evaluation.

Kozma (2002) states that World teachers and students were more likely to use computers to engage in a number of classroom activities associated with the information society, such as gathering data for a research project, collecting information about another country, exchanging information with students elsewhere, and collaborating with students in other schools on learning projects.

With direct reference to education, Hawkins (2002) writes about World Links for Development Programme's experiences in connecting schools to the Internet and conceptualizes the story into ten practical lessons that policymakers and business and community leaders should consider as they plan to incorporate the Internet in the educational process. These lessons are (Hawkins, 2002):

- Computer Labs in developing countries take time and money, but they work.
- Technical support cannot be overlooked.
- Non-competitive telecommunications infrastructure, policies, and regulations impede connectivity and sustainability.
- Wireless technology is most effective for connecting schools in developing countries.
- The community should be involved.
- Private-public sector partnerships are essential.
- ICT and education efforts should be linked to broader education reforms.
- The professional development of teachers sits at the heart of any successful technology and education programme.
- Technology empowers girls.
- Technology motivates students and energizes classrooms.

GeSCI

GeSCI has been established in 2004 by UN ICT Task Force to harness the power of new technologies to strengthen education and communities around the world (Bracey, 2005). In partnership with governments, the private sector, and civil society, GeSCI cultivates the growth of ICT in secondary education environments (Bracey, 2005).

As the UN Secretary General Kofi Annan (2005) states "the GeSCI matches the power of ICT with educational need, and has the potential not only to improve education, but also to empower people".

With reference to GeSCI initiative, Dufborg (2005) states that the integration of ICT into secondary education systems is of particular value to developing countries because it gives them an opportunity to leapfrog inherent limitations and to acquire new resources.

Similarly, deriving from the GeSCI experience, Twinomugisha, Callan and Bunworth (2005) have developed a framework regarding the deployment of ICT in education. Twinomugisha, Callan and Bunworth (2005) have based their approach on the following key considerations:

- There should be a focus on educational objectives since ICTs are a tool and not an end in themselves.
- Installing ICTs in schools is part of an integrated, comprehensive and on-going system.
- Benefits, feasibility and long term costs should be considered.

CTC s and Enlaces

CTCs or "telecentres" are used to increase access to technology and promote the use of technology in education in urban and rural areas and economically distressed communities.

In the literature, there exist many case studies that provide a description about these CTCs that focus on youth at the secondary school level (Michalchik & Penuel, 2003; Davies, Pinkett, Servon, & Wiley-Schwartz, 2003; Wagner, 2001; Best, Maclay, 2002). Especially, in developing countries, telecenters have also received a great deal of attention, particularly as a way of providing greater technology access, with the broader goal of increasing economic

development (Proenza et al., 2001).

To exemplify, the Enlaces Project being an ICT initiative of the Chilean Educational Reform provide all of the nation's secondary schools with computers (Hepp, Hinostroza, Laval, Rehbein, 2004). The program provides schools with computer labs, community access to technology, access to an education portal on the Internet and training in the use of technology (Wagner, Kozma, 2003).

The results of the study of (Hinostraza, Guzman and Isaacs, 2002) show that these projects did not provide evidence of having impact on students' learning as defined in the national curriculum. However, they show that students participating in these projects had the opportunity to develop abilities defined as cross-curricular and practised ICT related skills (Hinostraza, Guzman and Isaacs, 2002).

Additionally, regarding the Enlaces Project, Hepp, Hinostroza, Laval, Rehbein (2004) emphasize that that there is no universal truth when it comes to applying ICT in education, and that there is no advice that can be directly applied without considering each country's reality, priorities and long-term budgetary prospects and commitment.

National Policies

Needless to say, there have been several implications of country specific policies on a national level in the use of ICTs. This group of studies shares the assumption that the impact of IT adoption on a country's development including education is positive, and therefore analyzes different policy scenarios that would favor faster diffusion of ICTs (Kozma, Wagner, 2003; Kozma, 2002; Jhurree, 2005, Lim, 2002; Cossa, Cronje, 2004; Leask, Kington, 2000; Monstad, 2004).

Similarly, Kozma (2005a) has explored in his paper "ICT, Education Reform and Economic Growth". the relationships between ICT, education, and economic and social development. Kozma (2005a) suggests how policy makers can best connect technology and education reform to sustained, equitable economic growth.

International agencies such as the World Bank Institute's report provide implementation strategies for support of ICT in education in developing countries (World Bank, 2002) and proceedings of the World Summit on the Information Society address barriers in the area of education (WSIS Civil Society Plenary, 2003).

One of the organizations that has been consistently studying the relation between IT and country's economic growth is OECD. A series of OECD studies have been carried out by the OECD's Development Centre intended for the design and establishment of economic policies (OECD 2000). However, these studies, however, focus on OECD member countries, and only occasionally include data from developing countries for comparative purposes.

Similarly, the International Telecommunication Union (ITU) has carried out a series of case studies on the diffusion of the internet in countries at different stages of development (ITU, 2003). The studies undertaken by ITU describe the growth and diffusion of internet at country and regional level. In most of these descriptive studies, individual countries are examined from a technical angle concentrating mainly on the student per computer ratio or the number of internet users in schools (Rice, 2003).

Moreover, the European Commission has produced reports that explain the plan of actions for an information society and studying impacts of information society in several countries (Commission of the European Communities, 2003; Sayan, Elci, Avci, 2004).

Additionally, Kozma (2005b) discusses in his paper "National Policies that Connect ICT-Based Education Reform to Economic and Social Development" how the coordination of policies within and across ministries can support a nation's efforts to improve social conditions by highlighting special concerns and challenges of developing countries.

Furthermore, Cossa and Cronje (2004) discuss in their article "Computers for Africa: Lessons Learnt from Introducing Computers into Schools in Mozambique" a research undertaken to document the process of introducing and using information and communication technology (ICT) in the secondary schools of Mozambique in the last three years of the 20th century. Their study shows that, in spite of the extreme socio-political background and relatively low levels of training, the project has been reasonably successful (Cossa and Cronje, 2004). They also note that it is the social and cultural impact of the project of

introducing ICT in Mozambican schools that needs to be analysed in depth to reveal the real contribution of the project to the development of Mozambican society (Cossa and Cronje, 2004).

As Alcántara (2001) claims, at the national policy level, no single ICT strategy is likely to prove most effective in all cases. Furthermore, Alcántara (2001) maintains that: "in the process of designing an appropriate local strategy for using ICTs to the benefit of disadvantaged groups, success will depend at least as much on understanding the structure of economic and political constraints affecting people's livelihood as on remedying immediate problems of access to ICTs." (Alcántara, 2001). Alcántara (2001) also notes that national ICT strategies must balance the benefits of investing in computers and Internet access against the need to improve basic services.

Country Comparisons

According to Trujillo (2000), one of the reasons that studies dealing with cross-country comparisons between the link of information technologies and national development are less frequent, may be due to the fact that comparisons among countries require agreement on an underlying theoretical conceptual model that does not yet exist.

In their book "Computers in Third-World Schools", Hawkridge, Jaworski and McMahon (1990) have looked at experience in African, Asian and Arabic-speaking countries that already have computers in some of their schools and have identified the rationales commonly deployed by Ministries of Education and international agencies. Deriving from these experiences, Hawkridge, Jaworski and McMahon (1990) justify using computers in schools by defining the following four rationales in the related chapter "Do Schools in Developing Countries Need Computers?":

- *Social rationale:* This rationale deals with all students' place in society and is the demystification of the importance of computers at school level.
- *Vocational rationale:* This refers to the need to prepare learners for employment through providing computer education.
- *Pedagogical rationale:* This rationale calls for improved teaching and learning. Computers as sophisticated educational tools can extend traditional ways of presenting information to children and enrich the existing curriculum.
- *Catalytic rationale:* This rationale states that schools can be changed for the better by the introduction of computers and that teaching, administrative and managerial efficiency may be improved.

Hawkridge, Jaworski and McMahon (1990) also argue for a long-term view of the potential of computers to liberate education and thus reduce dependency and inequality.

Likewise, Kozma (2005b) identifies in his paper as mentioned above "National Policies that Connect ICT-Based Education Reform to Economic and Social Development"- a systemic framework of types of development that can be used to connect ICT-based education reform to national social development goals. For this purpose, Kozma (2005b) demonstrates three national case studies, namely, Singapore, Finland, and Egypt.

Furthermore, Alcántara (2001)'s paper "The Development Divide in a Digital Age" discussess the role that ICTs can play in improving the level of education. Alcántara (2001) highlights in his paper the differences among Third World countries in their capacity to use information technologies for development including the field of education.

Empirical Research

Abbott (2001) quotes in his book "ICT: Changing Education" from Selwyn (1998) who claims that "IT' s benefits to schools have largely remained unchallenged". Selwyn (1998)'s argument to this effects is worth quoting at length: "there is an emphasis on quantitative and case study research in this area at the expense of qualitative and ethnographic approaches […]. Societal belief in IT as a technical fix has blighted the successful integration of ICT into the educational system over the last twenty years".

On the contrary, some argue that discussions on the nature and characteristics of the digital divide are not supported by empirical research literature and that existing empirical research regarding the effects of the global digital divide and development in the developing world is modest (Trujillo, 2000). Yet, there are some studies that are worth to mention.

To begin with, Arquette (2001) explores in his research paper "Assessing the Digital Divide" the various discursive approaches to framing the research on the digital divide. From a meta-analysis of the different discursive frameworks, Arquette (2001) proposes the Information Intelligence Quotient (IIQ) as a tool for assessing the state of a target community's information and communication system development. Although the results can not be easily applied into the area of education, his results provide descriptive evidence that regardless of discursive framework, there is a digital divide (Arquette, 2001).

In his book "Access Denied in the Information Age", Stephen (1998) focuses on how technology is utilized. Using an analysis of his empirical data, Stephen (1998) claims that ICTs might provide the opportunity to reduce the unit cost of education to the point where the society could afford to provide open and equal access to learning opportunities for all members throughout their lives.

Another book including an empirical research in this area is "The Digital Divide: Facing A Crisis or Creating A Myth?" that has been written by Compaine (2001). As a result of a national survey "Falling Through the Net", Compaine (2001) claims that the overall impact of computer access in schools appears to have been beneficial to education and that this access must be provided by the schools. On a similar note, Compaine (2001) also states that those children with access to computers will reap social and educational benefits.

Conclusion

The right to education has been enshrined in the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights and other instruments, and it has been declared as essential for the eradication of poverty (Commission of the European Communities, 2003), and the elimination of all forms of discrimination, thus in the information society, a specific effort on digital literacy is required (Commission of the European Communities, 2003).

A preliminary conclusion drawn from the reports produced by international development agencies, studies that measure the diffusion of ICT in the developing world, and the few empirical studies that evaluate the relation between information technology and development is that the global digital divide exists and is diverging (Trujillo, 2000).

Furthermore, there exists a general lack of information in the literature regarding the relationship between the measurement of ICT and a country's educational development. Regardless of taking a positive or negative, instrumental or structural approach, the systematic exploration of the effects of the global digital divide (Trujillo, 2000) on national education process seems to be a logical first step.

In the literature, there has been also a mention of the possibilities for further research:

Firstly, as Adeya (2002) suggests there is a need to assess the curricula being used or that are being proposed for use on the study of ICTs in education to ensure that those from developing countries are using the right approach and appropriate content to train their current and future labour-force. This is important at all levels of education, as the literature is clear on the need for 'appropriate skills' and not on simply hardware development (Adeya, 2002).

Additionally, Adeya (2002) suggests that more studies are needed that focus on the social analysis of the use of ICTs to understand what kinds of assumptions are made about social relationships between people, support structures for the range of technological options, and how these may restructure the education and the social life.

Moreover, Wijewardena (2002) suggests that the study of the digital divide must move away from ad-hoc analysis methods to a more technical approach with policy prescriptions being guided clearly by understanding of the underlying causes of the digital divide. Wijewardena (2002) also states that narrowing the digital divide should be a key goal of public policy.

To conclude, the issues outlined in this paper are not unique to developing countries since schools around the world face the same challenges and by and large the same lessons apply (Hawkins, 2006). Advantage should be taken of the power of technology to improve the conditions in the educational area. As Hawkin (2002) states if together this transformation could be begun, "schools a hundred years from now will sit at the heart of a learning society and allow

youth from any country in the world—rich or poor—to have the same opportunities to create a better world".

List of Abbreviations and Acronyms

CTC- Community Technology Centre

EU- European Union

GeSCI- Global e-Schools and Communities Initiative

ICT- Information and Communications Technology

ITU- International Telecommunications Union

LDC- Less Developed Country

NGO- Non-Governmental Organization

OECD- Organisation for Economic Co-operation and Development

SITES- Second Information Technology in Education Study

UN- United Nations

UNDP- United Nations Development Program

UNESCO-United Nations Educational, Scientific and Cultural Organization

UNICEF- United Nations Children's Fund"Narrowing the divide-publishing a newspaper in every village, placing a radio, and wiring every building to the Internet- does not automatically solve the problem. The most serious divide is in the extent and quality of human knowledge and learning. It is not digital, it is educational." (Haddad, 2001.)

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