CHAPTER 2: REVIEW OF THE LITERATURE

This chapter reviews the literature and is organized into three components. First, a discussion about globalization is presented. The second section reviews the literature relevant to the digital divide. Third, a review of the literature concentrating on ICT in education of less developed nations is explored.

Langhorne (2001) claimed the costs of globalization include transnational market failures, economic turbulence, increased disparity in income distribution, geographical exclusion from the benefits of globalization, and threats to systems of social insurance. With the globalization of economics, capitalism, technology, and culture, societies have become intricately linked and forever changed. Many globalization processes have increasingly become technologically driven. As globalization increases, the demand and use of ICTs will also increase. One externality of globalization from a technological perspective is the divide caused by the lack of use and lack of access to technology to disseminate and use information. Thus, nations unable to tap into the information revolution will be further marginalized.

Globalization

Thacker (2001) found that globalization has created "some major disadvantages for those unable to participate in the global economic system" (p. 3). Castells (1996) claimed the new economy is based on ICTs and is centered around interdependence, asymmetry, regionalization, and exclusionary segmentation. Castells noted,

> The architecture of the global economy features an asymmetrically interdependent world organized around three major economic regions [North America, the European Union, and the Asia-Pacific] and is increasingly creating gaps between

productive, affluent information rich areas and impoverished areas that are economically devalued and socially excluded. (p. 27)

Langhorne (2001) claimed globalization has occurred because technological advances have destroyed physical barriers to global communications "which used to limit how much connected or cooperative activity of any kind could happen over long distances" (p. 2). Giddens (2003) claimed that the existence of ICTs "alters the very texture of our lives, rich and poor alike" (p. 11). The distance barrier is currently being broken through the use of ICTs in education systems of less developed nations and it is changing the texture of peoples' lives who are most disenfranchised in the global economy. Cairncross (2001) claimed that the "the death of distance and the communication revolution will be among the most important forces shaping economies and society in the next fifty years or so" (p. 2). Cairncross further noted that through globalization and ICTs "poor countries control their own destinies… because developing countries start off with so much less capital investment per worker than rich countries, they have huge scope to grow rapidly simply by buying technology already invented in the rich world and copying first-world production methods" (p. 288-289). Pieterse (2004) agreed that ICTs and technological changes are shaping globalization. This author however denied the notion of technological determinism. "What matters is not technology per se but the way it is harnessed by economic, political, and social forces" (p. 10).

In a longitudinal study of 19 countries, Dordick and Wang (1993) looked at infrastructure, economic, and social measures to determine how information technology has transformed from the 1970s to the 1990s, how ICTs have been harnessed, and to

forecast what is ahead. The researchers found significant growth in all three dimensions in nearly all of the 19 national studies. The researcher stated "it should not be surprising that the information technologies have replaced communication technologies as the great hope for economic growth" (p. 25). Further, Dordick and Wang claimed,

> Technology is not neutral; what technology reaches the individual, either through the market or government, and how these technologies are used are determined, in part, by the economic and political goals a nation has and by how people perceive their personal goals for progress and for achieving the good life. (p. 27)

Further, Brown (2003) said "when the global transfer of skilled workers is coupled with the advent of new information and communication technologies, it exacerbates the gap that already exists between the haves and the have nots" (p. 3).

James's (1999) book, *Globalization, Information, and Development*, is written from the perspective that less developed nations are at the intersection of globalization and ICTs. "Since there are various mechanisms through which information technology exerts a powerful influence over globalization, those same mechanisms must also tend to shape the patterns of gains and losses that globalization itself induces" (p. 2). Written mainly from an infrastructure and economic point of view, James found that the adaptation and adoption of ICTs explains why some less developed nations have been incorporated into the global economy while other less developed nations have become increasingly marginalized. James concluded that there is increased polarization within less developed nations due to the impact of ICTs. This polarizing divide between both more developed and less developed nations and within these nations is the subject of the following section.

The Digital Divide

The term ‘digital divide’ originated in the mid-1990s when the National Telecommunications Infrastructure Administration (NTIA, 1995, 1998, 1999) of the U.S. Department of Commerce published a series of survey data analyses showing the disparities between those Americans who had access to computers and the Internet and those who did not. Based on U.S. Census Bureau data, these reports measured ICTs including telephones, computers, and the Internet. These reports aimed to inform policymakers, researchers, academ1ics, the ICT industry, and the general public. Light (2001) claimed the results of these three studies have been used to “argue for government intervention and public-private partnerships” (p. 713). From these publications, the U.S. administration and U.S. journalist quickly adopted the term, ‘digital divide.’

It is evident that most authors in the literature agree on the term’s basic definition: the gap between those who have access to ICTs in contrast to those who have limited or no access to ICTs. Nonetheless, some researchers take issue with the scope of this definition and have attempted to redefine the reach of the digital divide. Guichard (2003) summed up this confusion by calling the term “fuzzy” in stating it “is as widely spread as it is badly defined” (p. 69).

Sevron (2002) claimed the digital divide is a term that should be focused more holistically on access to the global wealth of information through the use of ICTs, information technology literacy, and culturally responsive content that is created and needed by disenfranchised groups. Wilson (2004) reported on a global study of the digital divide and defined it as “the inequality in access, distribution, and use of information and communication technologies between two or more populations” (p. 300). Other authors

found some definitions of the digital divide to be exclusionary and simplistic by limiting the digital divide to a matter of technological infrastructure. Mossberber and Stansbury (2003) attempted to redefine the term 'digital divide' by categorizing it as a collection of unique interdependent divides that include: access to computers; skills of technical competency and information literacy; beliefs about economic advancement, attitudes, and experiences with distance educational opportunities; and democratic participation using ICTs to research political information.

Since researchers have narrowed or expanded the definition of the digital divide, the existing data is difficult to compare due to this moving and ambiguous unit of analysis. For example, Guichard (2003) studied the digital divide to determine if it existed and dismissed statistical data on the basis that the figures neglect the impact of factors such as culture, industry, politics, and geography. Guichard compared Internet use between countries and found the following pairs of countries are relatively equal: Japan/Australia; France/Malaysia; Russia/Palestine; and Hong Kong/Norway. Guichard concluded that "any national prejudice or preconception can be inferred from *a posteriori* interpretations of this numerical list" (p. 74). Guichard adamantly argued against using economic or social indicators to measure the digital divide. Guichard concluded that any measures of the digital divide should include cultural and intellectual segregations. For Guichard, the digital divide is not about inequalities of hardware but rather inequalities brought on by groups not being able to use or gain access to information or lacking the standing to make a change given culturally-appropriate, culturally-relevant information.

Fink and Kenny (2003) found four interpretations of the digital divide in the literature: a gap in access to ICTs; a gap in the ability to use ICTs; a gap in the actual use

of ICTs; and a gap in the impact of the use of ICTs. In the current research, it is accepted that the digital divide consists of each of these four interpretations. These four interpretations encompass most of the definitions in the literature. Thus, addressing the digital divide means addressing aspects of each component. What follows is a review of the literature pertinent to studies focused on what nations are doing to address their global digital divide.

Studies on the Digital Divide

Many English-published studies on the digital divide focus on the United States. Within the United States, authors tend to center on certain characteristics or demographics. For example, Servon (2002) focused only on urban populations. Servon chose this population due to high poverty levels and the high concentration of technology initiatives located in urban areas. This researcher attempted to gain an understanding of the urban digital divide as well as present useful models of success. Santos, Santos, and Milliron (2003) explored issues of technology access and literacy within urban, rural, and suburban community colleges as well as tribal colleges by focusing on race and gender. This quantitative study sought to investigate if certain populations are differentially served in community colleges in regard to digital opportunities.

Mossberger and Stansbury (2003) focused their study on socio-economics in an attempt to develop "a more accurate assessment of the problem and [provide] more information about the needs, attitudes, and experiences of the low-income and minority communities" (p. 1). In order to gain a more accurate portrayal of the experiences and attitudes of disadvantaged groups, the authors randomly sampled people from high-poverty census tracts and compared that data to surveys from the general population.

These authors measured Internet use, technical competence, information literacy, attitudes and experiences of online job searches and online coursework, and attitudes and experiences regarding Internet voting and politically focused web searches. These authors concluded that divisions exist in the U.S. in regard to access, skills, economic opportunities, and democracy. Major reasons for these divides included income, education, race, age, ethnicity, education, and computer literacy.

The digital divide is an issue increasingly discussed in an international and global context. To date, no study has been published on the global digital divide in respect to all 193 independent nations. The closest study would be that conducted out of Yale's Economic Growth Center. In this study, Chinn and Fairlie (2004) focused on 161 countries over the 1999-2001 period in an attempt to identify causes of the global digital divide. These researchers conducted various regression analyses based on economic variables, demographic variables, infrastructure indicators, telecommunications pricing measures, and regulatory quality. Chinn and Fairlie (2004) concluded that "our results suggest that public investment in human capital, telecommunications infrastructure, and the regulatory infrastructure can mitigate the gap in PC [personal computer] and Internet use" (p. i).

Similar to the Chinn and Fairlie (2004) study, Rodriguez and Wilson (2000) conducted a large-scale global study on the digital divide based on World Bank data. This study was later expanded into a book by one of the authors (Wilson, 2004). Rodriquez and Wilson (2000) noted that the nonexistence of global research on the digital divide lies in the fact that no single ICT database exists. The World Bank hosts the most data covering only 110 countries and excludes many of the world's poorest, least developed

nations. Thus, to date, most research focusing on the global digital divide essentially excludes many of the nations most deeply impacted by the digital divide.

Xiaoming and Kay (2004) conducted a study of Asian nations in an attempt to understand Internet growth and its relationship to social, economic, and political factors. The results of this study support those found in the Chinn and Fairlie (2004) study above but also included social and political implications. Xiaoming and Kay (2004) found that "Internet penetration is related to a country's wealth, telecommunication infrastructure, urbanization and stability of the governance, but not related to the literacy level, political freedom, and English proficiency" (p. 1).

Tiene (2002) examined the digital divide by comparing multiple data sources from institutions including the World Bank and the International Telecommunications Union. Tiene compiled various ICT indicators including regional Internet utilization, ICT indicators in 15 Asian countries, Internet users in 24 Asian countries, Internet costs from a dozen nations, rankings of Internet user levels and cost, common obstacles in addressing the digital divide, funding sources addressing ICT, distance learning programs, and ICT projects. This study pointed out that more research and efforts need to be focused in the area of ICT for development. This call for research was evident when Tiene stated, "for as long as millions remain without the technology to communicate effectively, obtain information they need, and become better educated, conditions of poverty will continue to prevail across most of the planet" (p. 221).

In a longitudinal, comparative analysis of 19 nations at many levels of development, Dordick and Wang (1993) concluded that "disparities among nations were very noticeable in all measures" which include economic, infrastructure, and social

development and change (p. 126). Additionally, gains in ICT access and ICT use in less developed nations was found to be unevenly distributed. Although not using a rigid statistical analysis, Dordick and Wang forecasted that ICTs will become more desired by less developed nations, but ICTs may add to rather than solve a nation's problems. With regard to this disparity, the researchers concluded, "to turn the information revolution to their advantage and enhance economic growth is a major concern for policymakers in developing nations" (p. 127).

Hachigian and Wu (2003) studied the digital divide in the Asia-Pacific region. These researchers investigated how Asian countries used and produced ICTs. Specifically they found: Japan, South Korea, Singapore, and Taiwan are major users and producers of technology; Australia, Hong Kong, and New Zealand are large users of technology but not producers; and Malaysia, the Philippines, and Thailand are large producers but not users of ICTs. Hachigian and Wu found Asian nations in general follow Japan's example of technology production and China and India are becoming increasingly major users and producers of technology. Additionally, the researchers found that technology is reshaping politics and governance in the Asia-Pacific region.

Cohen, Garibaldi, and Scarpetta (2004) investigated the digital divide in the Organization for Economic Cooperation and Development (OECD) countries. The authors researched three topics. First, Cohen et al. wanted to determine if there is a relationship between ICT and the widening disparities across countries in the OECD. Using macro, sectoral, and firm turnover data, Cohen et al. found that ICTs are contributing to disparities across these nations. Second, the researchers wanted to determine why some OECD nations were successfully using ICTs while others were not.

By looking at OECD indicators of product and labor market regulations, the authors found that OECD nations such as the U.S. are successful due to its ability to experiment in various markets. The vast geographical size of countries such as the U.S. was found to be an asset in comparison to smaller nations such as Germany. Finally, Cohen et al. sought to understand the extent to which the Internet reduced the "economic distance between industrial and developing countries" (p. xx). The researchers found the Internet affected production and exchange, but many hurdles exist when dealing with distribution. Additionally, it was found that e-business depends on governance, regulations, legal protection, and security. These factors are often missing or weak in less developed nations. Cohen et al. concluded that "the full exploitation of the new technology by developing countries . . . is further delayed by institutional constraints" (p. xxv).

Authors have researched the digital divide in North Korea (Lee & Hwang, 2005), Eastern Europe (Dragulanescu, 2002), Latin America (Galperin, 2005), and India (Chandra, 2002; Mitra, 2003; Singh, 2002) among many others locations. From these studies, it is evident that some less developed nations have experienced success in developing Internet cafés, creating information portals for farmers, achieving rapid development and dissemination of electronic information, setting up local area networks (LAN) and wide area networks (WAN), creating wireless networks, and implementing hole-in-the-wall experiments where computers are literally embedded in brick walls near a slum. It is evident that some less developed nations as well as communities within less developed nations are trying innovative concepts in an attempt to close their digital divide. Many of these innovations are producing benefits and are thus reducing the impact of the digital divide. The literature does details a limited number of local projects.

However, this body of research fails to move beyond programmatic descriptions to capture the experiences of the people impacted by these initiatives.

A review of the literature demonstrated there is no agreement on the unit of analysis when investigating the digital divide. Chinn and Fairlie (2004), Xiaoming and Kay (2004), and Tiene (2002) focused on the divides between nations while other authors focused on cross-regional digital divides (Hachigian & Wu, 2003). In comparative studies, the unit of analysis is usually more developed countries such as the U.S., Germany, or other OECD countries compared with less developed countries (Cohen et al., 2004). The comparison of more developed and less developed countries however was most evident in the work of Wong (2001) who conducted an analysis of existing data to investigate the digital divide in Asia. Wong concluded that a significant digital divide exists between the more developed and less developed Asian nations as well as between Asian and non-Asian nations.

Some researchers have helped to elucidate strategies less developed nations may employ to transcend the digital divide. Foulger (2002) wrote an article titled "Seven Bridges over the Global Digital Divide." Foulger noted there are seven fundamental bridges less developed nations must cross before actually crossing the digital divide. These seven bridges include:

1. Social and legal constraints - This aspect includes censorship and free access as well as health and lifespan issues.
2. Economic priorities - Foulger claimed that nations with low average per student expenditure on education will not be able to provide basic ICT needs.

3. Basic infrastructure - This constraint includes buildings and power. Foulger stated, that "local power infrastructure solutions can provide quick local solutions to bootstrapping computer use and providing very low speed Internet access" (p. 5).
4. Literacy and language - ICTs are effectively unusable without the ability to read.
5. Network infrastructure and connectivity
6. Computer resources
7. Choice

Foulger's conclusions were based on UNESCO data using multiple regression models and descriptive statistics. Interestingly, Foulger's main assertion was that "bridging the global telephone divide is a necessary prerequisite to a bridging of the global digital divide" (p. 32). The divides found by Foulger were similar to those stated by Peters (2003). Peters noted the digital divide consists of separate divides which include: physical access, appropriate technology, affordability, capacity, relevant content, integration into people's lives, socio-cultural factors, and trust in regard to privacy, security, and cybercrime.

A weakness of existing studies that focus on the digital divide in an international context is the lack of original, collected data and a predisposition to use the West as a contextual comparative marker. Such an approach does not inform less developed nations in regard to what they can do to cross the digital divide on their own terms. Additionally, using existing data to discuss the digital divide does not add to the knowledge base about how less developed nations can successfully navigate the digital divide or what lessons

have been learned from doing so. Without added research detailing how less developed nations are addressing the digital divide, these already marginalized communities will be further disenfranchised in the global knowledge society.

Peizer (2004) concluded that when using ICT in less developed nations, cross-sector projects such as those partnering business industries with schools, must work "within the constructs of the existing system by leveraging its strengths and limiting its weaknesses" (p. 87). One of the strongest existing systems in a less developed nation is often its education system. Many NGOs, governments, and communities in less developed nations are making concerted efforts to address the nation's digital divide through the infusion of ICTs in their respective education systems. Researchers however are just beginning to investigate ICT in the education systems of less developed nations.

ICT in Education of Less Developed Nations

To date, little research has concentrated on ICT integration in the education system of less developed nations. This is despite the fact that the issue of ICT in less developed nations is becoming a topic of increasing media interest. Recently, plans have been made for the 'One Laptop per Child' (OLPC) initiative headed by Nicolas Negroponte of the Massachusetts Institute of Technology (MIT) Media Lab. This initiative aims to manufacture and disseminate $100 laptop computers to less developed nations around the world. This initiative was endorsed by the UNDP on January 28, 2006. The OLPC initiative created an increased global awareness of the digital divide and the need to address this divide through the education system of less developed nations. Many nations including Brazil, Argentina, Chile, China, Egypt, Nigeria, and Thailand have expressed an interest in joining the project (OLPC, 2007).

Most of the pertinent research in the literature concentrates primarily on sectors of society that directly impact the GDP or the economy despite the belief that ICTs "offer significant potential benefits for socioeconomic development" (Avgerou & Walsham, 2000). Studies with this macroeconomic focus for example include: Joshi (1984) studied technology planning in less developed nations; Rohitratana (2000) studied management information systems in Thailand; Nulens (2000) studied World Bank polices regarding information technology in Africa; Hall (2000) studied local language software in South Asia; and Menou (1993) presented models to measure the impact of technology on less developed nations. Thus, much of the existing literature tends to cover ICT in less developed countries broadly and from the macro-level of development.

In theorizing about poverty alleviation, Sachs (2005) claimed that investing in education is one of the key interventions the international development community can make. Sachs noted how investments need to be made in computer and mobile phone technologies along with technical infrastructure. In discussing his experiences in one of eight Kenyan villages, Sachs said, "without doubt, the village is ready and eager to be empowered by increased information and technical knowledge" (p. 33). This eagerness to harness the potential power of ICTs has been the impetus why less developed nations are making the choice to embrace these technologies.

Pelgrum's (2001) research focused on practitioners and their views about the obstacles of realizing ICT-related school goals. Pelgrum presented data from a study conducted by the International Association for the Evaluation of Educational Achievement between the years 1997-1999. The data was collected from primary and secondary schools in 26 countries in varying levels of development. This study failed to

represent any nation with an extremely low level of development, with the closest example being that of Thailand. Surveying principals and technology experts, Pelgrum constructed a list of 38 obstacles. In no particular order, the top ten obstacles to implementing ICT in education included:

1. insufficient number of computers;
2. lack of knowledge/skills of teachers;
3. difficulty in integrating ICT in instruction;
4. scheduling computer time;
5. insufficient peripherals;
6. not enough copies of software;
7. insufficient teacher time;
8. not enough simultaneous access to the Internet;
9. not enough supervision staff; and
10. a lack of technical assistance.

Pelgrum's (2001) study, albeit dated, fails to give less developed nations a roadmap of what is being done to overcome these given obstacles.

Rodrigo (2005) sought to understand what schools were doing in one developing city to cross the digital divide. Rodrigo conducted a cross-sectional survey of all public and private, both primary and secondary, schools in metro Manila. Rodrigo found the "levels of ICT deployment is still too low to provide metro Manila students with quality learning experiences" (p. 66). In line with Pelgrum's (2001) challenges noted above, the challenges that existed for schools in metro Manila were inadequate levels of computers, limited software availability, and limited Internet connectivity.

Hawkins (2002) studied a World Bank program called World Links for Development. Kozma, McGhee, Marder, Baisden, Valdes, and Lewis (2000) stated this program was in response to "evolving technology, expanded opportunities, and growing disparities among nations" (p. 1). The World Links for Development program aimed to address the digital divide by providing schools and ministries of education in less developed nations with "sustainable solutions for mobilizing the necessary technologies, skills, and educational resources to prepare students and teachers to enter the Networked World" (p. 2). Hawkins (2002) noted that one of the key failures in many past ICT in education of less developed nations programs was that schools were given expensive ICT equipment without any support for professional development, national strategies, or community involvement. Hawkins pointed out ten lessons learned from the World Links for Development program.

1. Computer labs in less developed countries require money and time, yet they do work.
2. Providing technical support is vital.
3. Nations with a noncompetitive telecommunications infrastructure and unresponsive policies and regulations hinder connectivity and sustainability.
4. Wireless technology is more effective than physical wiring.
5. ICT in education programs need to involve the community in real and tangible ways possibly by sharing costs and facilities with the community.
6. Governments must partner with the private sector.
7. ICT in education initiatives should be linked with broader education reforms.
8. Both formal and informal sustained teacher training is pivotal.

9. ICTs empower girls.
10. ICTs motivate students to learn.

Hawkins (2002) summed up these lessons by pointing out that they are not limited to less developed nations. In Hawkins' perspective, these lessons can empower rural communities and give agency to students and teachers alike to bridge the digital divide and participate in the knowledge economy.

Some of the literature on ICTs in education of less developed nations is concentrated on the informal education sector. Colle (2000) conducted a descriptive study of the increasing proliferation of community-based communication centers, or telecenters, in less developed nations. Colle found there were three main forces driving this movement especially in Africa and Asia: ICTs can aid in rural development; access to ICTs is a goal for many less developed nations; and ICTs are seen as a way to develop small business ventures. Colle found nine main concerns related to the effectiveness of ICTs in regard to telecenters:

1. There exists an incompatibility of ICT equipment and projects.
2. The language and conceptualization of network language may be different for different users.
3. Low literacy levels may impede one's ability to make sense of the language of information.
4. Information must have relevance to people's unique communities and lives.
5. Not all cultures have bought into the value of information to inform one's community about laws, education, agriculture, and health.

6. The majority of the world's people have no experience with ICTs and thus experience technophobia.
7. The maintenance of technology is a grave concern.
8. Although citizens obtain information, they may lack resources to act on that information. For examples, farmers may learn of a new farming technique but cannot afford the required seed or the nutrients.
9. Many households and communities in less developed nations lack access to ICTs or the infrastructure to support those ICTs.

Colle (2000) noted that many concerns about the effectiveness of ICTs in less developed nations can be overcome with "suitable planning, support and training" (p. 419). Many ICT projects in less developed nations fail due to inadequate management rather than the failure of the technology itself. In an attempt to locate best practices and models of successful telecenters, Colle found:

- It is useful to have the support of policy makers and politicians.
- International and community partnerships increase the likelihood of success.
- Strategies need to be developed to ensure and increase participation.
- Marketing, business, orientation, and training planning must occur.
- Telecenters need to be flexible in what services they provide.
- Centers should be aggressive and creative in localizing knowledge and information sources. One option is to create start-up centers in existing organizations.
- Telecenters should be networked.
- Financial sustainability is needed.

- Holistic evaluations should be undertaken to determine profitability as well as the degree to which these centers are agents of change in areas such as health, education, self-efficacy, family welfare, and community development.

Some studies have sought to address solutions to the global digital divide through ICT in education. In a study that reviewed ICT in education strategy success and failure, Tiene (2004) pointed out that many efforts to bring ICT to less developed nations have failed to improve educational efforts. Tiene noted that "one critical mistake is to be overly ambitious and overly optimistic about what technology can accomplish" (p. 90). It was found that schools in many less developed nations have failed to realize that ICT is not constrained to hardware. Owning ICTs is also about software, management of ICT resources and support, and the ability to troubleshoot in addition to repair and replace parts when needed. Another common mistake is to not include teachers in the ICT planning. Tiene concluded that "teacher-proof strategies were generally more foolish than foolproof" (p. 92). This mistake was also noted by Hawkins (2002).

Tiene (2004) provided various strategies for implementing ICTs in classrooms of less developed nations. Tiene suggested that a needs-analysis be conducted to determine if ICTs can actually address the problems an education system seeks to fix. Tiene further suggested that project planners keep the scope and scale of the project reasonable. This would involve sufficient piloting and continued formative assessments. To keep costs low, Tiene suggested using more traditional technologies versus the latest, most expensive technologies. Similarly, to maximize ICT investments, Tiene claimed multi-purpose projects work well. These multi-purpose projects may include using the ICT resources in an evening community center. "Multi-user, multi-purpose projects are the

best way to involve the most people in ICT-based activities" (p. 92). Tiene noted how challenges to ICT in education projects in less developed nations included continued financial support, sustainability, and scalability.

Chapman and Mahlck (2004) edited an anthology called *Adapting Technology for School Improvement: A Global Perspective*, dedicated to ICT in education concentrating on nations in varying degrees of development such as Palau, Jamaica, Ethiopia, Morocco, Namibia, Argentina, Iceland, Germany, Czech Republic, Chile, Mexico, and Brazil. The book was written for practitioners to inform them of key ICT in education issues and aid teachers in integrating ICT into their classroom practices. The entries in this anthology heavily focus on policy and program descriptions however some entries are based on originally collected data.

For example, as part of the Chapman and Mahlck (2004) anthology, Sales and Emesiochl (2004) studied ICT in the Republic of Palau. The researchers collected data from: observations; interviews with principals, technology coordinators, and Ministry of Education officials; and an ongoing document analysis. The researchers noted that to increase student learning schools must have adequate technology, relevant software, trained technology coordinators, time, incentives, technical assistance, training plans, and equipment upgrades. Sales and Emesiochl noted that "only when these elements work together can technology become a meaningful part of the educational experience of Palau's students" (p. 98). From this and other additions in this anthology, Chapman and Mahlck (2004) were able to make nine general observations about ICT in education (p. 300):

- Technology is not the solution to all problems.

- ICT can change pedagogical practices.
- ICT can increase existing inequalities.
- More ICT equates to more cross-national sharing of teaching resources.
- Ministry support is needed at all levels.
- ICT innovations require advocacy.
- Using ICTs at primary and secondary levels creates cross-sector needs (e.g., education linked to employers).
- ICTs do not equate to quality instruction.
- Teachers are central to the effective implementation of ICTs.

Through the International Association for the Evaluation of Educational Achievement, Plomp, Anderson, Law, and Quale (2003) edited an anthology titled *Cross-national Information and Communication Technology Policy and Practices in Education*. To date, this is the largest single volume dedicated to comparing national ICT in education policies. The anthology presents data from over 30 countries with a focus on four elements: (1) the structure of the education system; (2) ICT in education policy and practices; (3) special issues; and (4) trends and future expectations (p. xii). Since the focus of this book was on ICT in education policy, it is not surprising that most additions are from more developed nations. However, country studies are included for: Chile, China, India, Malaysia, the Philippines, and Thailand. Anderson (2003) noted how the Internet and LANs present the greatest implication for ICT in education planning. Anderson stated "this movement forces educational systems (and schools, in many instances) to make decisions about infrastructure acquisition, curriculum change, and staff development" (p. 4).

In a desk study conducted for the UNDP, Tinio (2003) claimed ICTs can be used to improve the quality of education, motivate students to learn, facilitate basic skills acquisition, and enhance teacher training. By pointing to various studies on ICT in education, Tinio found ICT in education for development programs are faced with various hurdles. These include the need for adequate planning, infrastructure, capacity-building, language, content, cost, and dispelling the belief that ICTs are a panacea. Although this study pointed to problems at the project level, it failed to address how or what problems are perceived or dealt with by the end user.

Cheng (2001) researched the effects of globalization on education systems of nations for the last half of the 1990s in the Asia-Pacific region, namely Australia, Japan, Hong Kong, Korea, Malaysia, mainland China, New Zealand, the Philippines, Thailand, Vietnam, Laos, Taiwan, India, and Indonesia. The researcher conducted a document analysis using numerous country reports and policy documents from these countries and found that educational initiatives for promoting ICT have met with some common challenges. Cheng and Townsend (2000) and Cheng (2001) cited four regional issues with using ICT in education. First, there is incongruence between educational aims and uses of ICT. Policy makers must thus consider the achievement goals when developing ICT strategies. Second, there is a gap among hardware, software, and training. The challenge here is for nations to develop a comprehensive ICT package that includes "hardware, software, and training as well as a [sic] IT platform to support and maintain the effective and efficient use of IT in teaching and learning …particularly in some developing areas" (p. 12). Third, nations in this region are challenged to bridge the gap between ICT and curriculum development. Advancements in ICTs occur so fast that

curriculum developers in most Asia-Pacific countries have difficulty keeping up. Finally, nations in this region are experiencing a challenge of bridging technological change and cultural change. Failure to adjust to the paradigm shift has caused strong resistance from school practitioners. “How to change the existing attitudes and beliefs into a new IT culture is clearly a serious challenge in the reform no matter whether in developing countries or developed areas” (p. 13).

Cheng (2001) noted that solutions to address these ICT in education for development challenges need to be supported by educational research. Based on previous work by Cheng and Cheung (1995), Cheng (2001) pointed out that further research needs to be conducted in the following frames:

1) Frame 1 - includes research on the background and underlying principles of policy goals and formulation. This background research includes understanding the legal, philosophical, and traditional beliefs that go into policy development.
2) Frame 2 - involves research on the policy formulation process. Aspects of this frame include characteristics of the policy making body, decision making processes, various perspectives, technology, and overall quality of the policy.
3) Frame 3 - requires research to be conducted on the policy implementation process. “Research in this frame concerns the understanding, identifying and bridging the gaps between education policy planning and its implementation” (p. 28). Areas of research under this frame include: cognitive, psychological, and technical readiness of stakeholders; readiness of resources; framework of

policy implementation; legal preparation; and the level of planned change by the policy.

4) Frame 4 - requires more research to be conducted on the educational policy effects. This research would focus on implementation and outcomes of educational policy.

Finally, Cheng claimed that in addition to these four frames, research needs to be conducted on developing a knowledge base on how to develop an overarching ICT framework. In discussing ICT reforms in Hong Kong, Cheng (2001) brought up this question:

> The use of Information Technology in schools is going to have significant impact upon the management culture of the school, the assessment approaches, the learning culture, as well as the methods of teaching. How is the IT reform to be coordinated with existing reforms in school-based management assessment reform, Chinese as the chief medium of instruction and other quality education reforms? (p. 29)

In researching access and quality using ICTs, Tinio (2003) found the existing research body lacked in originally collected data as well as in depth case studies. As shown above, research in this area is limited and is generally restricted to unpublished research and research published by NGOs or international organizations. Although the topic of ICT for development is becoming increasingly common and the field is becoming known as information and communication technology for development (ICT4D), the literature is brief and is often hegemonic in nature. What is left to be

determined is what are the challenges and factors impacting the end users' choice to adopt the ICT innovation offered through development in education projects?

The literature provides limited analyses of efforts to address the digital divide in less developed nations through ICT in education initiatives. The existing research however fails to capture the experiences of people as they struggle to make sense of the ICT innovation. Further, what is lacking in the literature are in depth case studies of ICT in education projects within institutions of less developed nations. From this lack of literature, researchers, politicians, leaders, and policy makers may be uncertain of the actual effectiveness of strategies used to help less developed nations cross the digital divide.

This lack of original data is problematic because leaders in less developed nations have no knowledge bank in which to turn to seek guidance and inspiration for what has made other ICT in education projects successful or to find lessons learned from other less developed nations. If more literature and research were available on the topic of ICT4D in education, policy makers and practitioners in less developed nations would have better, more applicable, points of comparison in addition to models of successes.

Summary of Literature Review

Globalization will continue to increase connections between nations and individuals. These connections are economic, informational, political, cultural, and social. Globalization is undoubtedly linked with the proliferation of ICTs. Informational and technological inequalities are exacerbated by the inability of the individual, the community, or the nation to access and effectively use ICTs. Due to these factors, nations are making strides to change the institution of education to address their digital divide.

The lessons learned about ICT in education of less developed nations are many. However, what the literature fails to detail and delineate are the experiences of the people who attempt to adopt and implement the ICT innovation in the education sector. In discussing ICT in education initiatives, Law and Plomp (2003) noted that "staff development is the key element in the implementation plan for any education change" (p. 23). More in-depth descriptions and analyses of the perspectives of participants of ICT in education projects are needed.

The ability of a less developed nations' education sector to harness the power of ICTs and to allow its citizens to communicate, to become more educated, and to adapt to the challenges brought on by globalization will be pivotal in the coming years. Cairncross (2001) concluded,

> The most important effect of the death of distance will be to narrow gaps not widen them. Where countries adapt their policies to allow new communications industries to flourish, they will find that the electronic world creates opportunities rather than shutting them. Communication, after all, is about bridging divides. (p. 290)