GOVERNMENTAL STRUCTURES, SOCIAL INCLUSION, AND THE DIGITAL DIVIDE: A DISCOURSE ON THE AFFINITY BETWEEN THE EFFECTS OF FREEDOM AND ACCESS TO ONLINE INFORMATION RESOURCES

by

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DEDICATION

This dissertation is dedicated to the many folks without whom I would not be at this point. First, to my family, especially my wife Andrea, and my boys, Caelin and Conner, who have all encouraged and strengthened me through this process. It has been a colossal group effort and without them, I would not have succeeded.

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ABSTRACT

This study discovers the level of relationship between democracy and access to online information. It defines democracy using freedom ratings from Freedom House, as well as economic factors, such as Gross Domestic Product and Foreign Direct Investment. The model also included a data set from Geddis, Wright and Frantz, who used a finer grained scale for autocratic countries.

It then explores the relationship between democracy and the level of access to online information using an ordinary least squares regression model. The level of access to online information was defined as the number of the internet users per capita within a country. The strength of the relationship indicated that this definition explained ~57% of the interaction between these variables.

In addition, the civil liberties ranking of a country was determine to have a statistically significant relationship to the number of internet users while the political rights of a country did not have a statistically significant relationship to the number of internet users.

By determining this level of relationship, policy makers can then make a better informed decision while deciding on methods to bridge the digital divide. In determining which factors can be adjusted by outside stakeholders, such as access to technology, and those factors which cannot, such as levels of democracy, policy makers can determine methods to increase their impact in narrowing the digital divide.

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List of Abbreviations

DSL ..... Digital Subscriber Line

FCC ..... Federal Communications Commission

FEMA ..... Federal Emergency Management Agency

GDP ..... Gross Domestic Product

ICT ..... Information and Communications Technology

ISP ..... Internet Service Provider

IT ..... Information Technology

LIS ..... Library and Information Science

NGO ..... Non-Governmental Organization

ROI ..... Return on Investment

UN ..... United Nations

CHAPTER 1

INTRODUCTION

Democracy and the Digital Divide

The purpose of this study was to ascertain whether the level of democracy a country possesses affects the digital divide and whether a person in a country considered free has greater levels of access to information than a person in a country considered not free. The research question being answered is whether levels of freedom affect the level of access to online information. The hypothesis being that as levels of freedom increase, the number of internet users per capita increases as well. In addition, this relationship has statistical significance.

Democracy is the rule of a country by its people, either directly or through a representative structure. Given that a country is run by the people, it would stand to reason that a highly democratic country would want its citizens to be well informed in order to make the best possible decision in regard to government policy. However, it is unclear whether this is actually the case. Some countries are like the United States, where the government is often restricted from providing access due to conflicts with corporate America. As part of its broadband plan, issued in 2010, the Federal Communications Commission (FCC) plans to "ensure universal access to broadband network services" ("Executive Summary," n.d.). However, Internet Service Providers (ISPs), such as Comcast, have already filed written complaints to the FCC, stating that the implementation of this new broadband access infrastructure would have significant,

detrimental effects on their businesses. It is assumed that if any of these plans actually begin to move forward, then numerous lawsuits will follow shortly thereafter.

While the FCC has shown that it is concerned with the digital divide, the agency must also walk a fine line between providing access to those who need it while not interfering with businesses making profits from those people who can already afford such access. In addition, once such infrastructure is built, it is unclear as to who will actually own it. To combat the FCC's plan, "six of the nation's largest ILEC/wireless/broadband providers—AT&T, Verizon, CenturyLink, FairPoint, Frontier, and Windstream—offered what they described as a comprehensive plan for reform of universal service and intercarrier compensation…" (Selwyn, 2011, ¶ 3). Selwyn (2011, ¶ 3) continued, "These seemingly ambitious goals aside, the ILECs' 'ABC Plan' is in reality a gambit aimed at protecting its sponsors' subsidized monopoly status and embedded investments in legacy technologies that are actually at odds with the FCC's stated goals."

Even in the United States, one of the most democratic countries in the world, the digital divide represents a complex situation with no easy answers. If a country with one of the strongest economies in the world is unable to solve the issue of the digital divide, what chance do countries with some of the weakest economies in the world have in addressing this divide?

One way for all countries to address the divide is to begin looking at what effects are present in the digital divide. By trying to sort out what has a significant effect and what does not, countries could then begin to focus their policy into ways that would have the greatest impact and then begin to work their way down the list of factors. By looking at the variables that come into play, a country could review the real costs associated with

the divide and look at how much impact an investment would have if they addressed a specific variable. This could be done by reviewing job opportunities between different groups that had access to online resources and those that do not.

This review would also allow a better understanding on some of the effects of the divide itself. If some investments give a significant return in a shorter amount of time, a country may be well advised to follow that investment first in order to provide funding for future development. As Mathur and Ambani (2005) stated, "The new technologies being developed can help surmount barriers present in providing information resources at a low cost and make applications feasible and profitable" (p. 345). Budhiraja and Sachdeva (2002) also state,

> ICT (Information and Communications Technology) is a key weapon in the war against world poverty. When used properly, it offers a tremendous potential to empower people in developing countries to overcome development obstacles; to address the most important social problems they face; and to strengthen communities, democratic institutions, a free press, and local economies (p. 3).

Opesade (2011) stated, "The World Bank reported that the 'knowledge gap' in many developing countries is a contributory factor to poverty and that there is no better way to bridge this divide than through the use of ICTs" (p. 102). By investing financial and administrative resources into the infrastructure needed for access, countries are able to not only combat the digital divide but also to use those resources to combat poverty as well. Opesade (2011) also mentioned the United Nations, "The United Nations Commission on Science and Technology for Development (UNCSTD), while acknowledging the predicament that most African nations face, warned of further

isolation if priority is not given to ICT strategies" (p.102). Without access to these online technologies, countries that are already behind in terms of development will fall even further behind the rest of the world.

Development is also increased by further investment in ICTs. This development would address some of the issues with the digital divide, such as the need for additional infrastructure. As Cieslikowski et al. stated, that developing countries have opportunities to use ICT's to gain greater levels of development. Mobile banking, job searches, price tracking and market demand are just a few examples of how mobile services can be leveraged in order to improve their daily lives (Cieslikowski, Halewood, Kimura, & Qiang, 2009).

From the mundane need for current weather conditions that could affect the planting decision of a farmer to the life-or-death need of a doctor to know the most current techniques being used to combat an illness, access to the Internet can help a user to make a more informed decision, which could have a lasting impact. Cieslikowski et al. further said that technological convergence could help increase productivity, increase trade, lower the cost of transactions and increase tax revenue. In addition, villages with access to broadband service can gain access to better market prices for their goods as well as job training (Cieslikowski, Halewood, Kimura, & Qiang, 2009).

The Impact of the Digital Divide

The digital divide is often defined as the demarcation between those with access to technology and those without such access (McClure, Bertot, & Zweizig, 1994; McConnaughey, Nila, & Sloan, 1995). The developed world is quickly adopting a knowledge based economy. This economy is based around quick, reliable access to information at the touch of a button. The sheer volume of information readily available

online is staggering, with estimates reaching over 672 exabytes of accessible data available on the Internet in 2013 ("Size of the Internet," 2013). One exabyte is equivalent to 1,000,000,000 Gigabytes. However, what happens to those groups that do not have such readily available access to online resources? How can a developing country begin to reach developed status when one of the primary factors in the knowledge economy is unavailable to them?

It is becoming more common for information to be published in digital formats. Many museums and libraries have begun to digitize their collections for outside use, and many journals have adopted a completely digital format. This shift to a digital format will cause a greater demand among those on the wrong side of the digital divide for greater levels of online access. As it becomes apparent that ICT growth helps to spur development, many more developing countries will begin to work on long-term ICT growth plans in order to reap the benefits, financial and otherwise, from those investments.

According to Mark Zuckerberg, the founder of Facebook, whose company has spent over $1 billion investing in Internet and communication technologies in developing countries:

> The story of the next century is the transition from an industrial, resource-based economy, to a knowledge economy. An industrial economy is zero sum. If you own an oil field, I cannot go in that same oil field. But knowledge works differently. If you know something, then you can share that—and then the whole world gets richer (Levy, 2013, ¶ 6).

For much of the developed world, the Internet is an invaluable tool. We can check the weather, follow our retirement funds, catch up on the news, and stay in touch with friends almost instantaneously. Instructors do not think twice about uploading large article files or links to streaming audio or video sites for their students to peruse. Students can enroll in online courses, regardless of their physical location or proximity to the school they are attending, due to the level of connectivity prevalent in their daily lives.

For those without access, however, such opportunities are not available. Researchers must rely on print versions of journals, which often lag months behind their online counterparts. While collaboration is possible, it is typically focused more on local peers who are readily available as opposed to peers who may have a greater understanding of the research being done.

"Today's world is divided not by ideology but by technology" (Sachs, 2000, ¶ 1) is a profound statement in our information society. As more reliance is given to digital resources and opportunities, those groups with little or no access to technology will fall further and further behind. However, for groups that have not been exposed to technology, they are at a disadvantage in both skill sets and opportunities.

In 1989, The World became the first commercial Internet service provider (ISP) (*The World*, 2006, ¶ 1).This new service let anyone, regardless of their affiliations or lack thereof, to gain access to the information being shared online. A new world of data and information was now available to anyone with the ability to connect to this network.

However, the early Internet was often difficult to navigate. Users had to know specifically where they wanted to go and how to get there. Software for this connectivity was often expensive to access, and at times, required some significant knowledge of

programming to fully use the functionality of the software. Once again, a divide was apparent between those who had the technology to access the network and those without it. Computer literacy rates were very low with only 35% of the workforce using computers in the workplace (Lowe, 1997, p. 30). Thus, the digital divide began. In addition, while some users had the technology, they did not have the skill set required to actually access the information available to them, widening this divide.

Digital Content and Access

New technological improvements gave users access to a large amount of information easily and made sure that it was at least somewhat relevant to the term for which they were searching. However, much of this information was only available in a digital format. Therefore, if a person did not have access to the World Wide Web or the Internet, they had no access to this information. In addition, many materials that were held at physical locations were often scanned and shared in a digital format, thus allowing those with access to online resources to use those materials regardless of their physical proximity to the original document. However, people without such electronic access were once again denied access to this material unless they went to the physical location of the document owner. For example, while South Sudan has a National Archive, with "documents in the Archive, which number tens of thousands, date from the colonial era up to the 1980s" (National Archive of South Sudan, n.d., ¶ 1), these documents are not digitally available. The only access to these records is to physically visit the storage facility.

Much of the world has continued on this path of digitization. In fact, many governments are now no longer printing many of their documents and instead are posting

electronic copies on their websites and letting users download them at their convenience. However, for those people without such access, they were beginning to be completely shut out of such a system. Many employers posted jobs only on their electronic job boards and encouraged prospective employees to submit their applications in a digital format.

Unfortunately, during the initial research into the digital divide by the National Telecommunications and Information Administration, the starting point was whether a person had the technology to access the Internet (Brown, Barram, & Irving, 1995).. It could be answered simply yes or no. If a person had a computer with a modem, then they were considered able to access the Internet. However, as technology continued to grow, the gradations of the digital divide grew as well. In addition, many scholars began to recognize that possession of the required technology did not equal actual access to the information available on the Internet. As Boris (2005) quoted from Hollifield and Donnermeyer (2003), "Past policy simply assumed that if information technologies were available, they soon would be adopted. But particularly with complex, high-cost information technologies, this 'field of dreams' approach is untenable" (p. 17).

Three Primary Factors of the Digital Divide

The question then began to slowly shift away from those with access and those without it toward the ways to address the digital divide. As scholars began to do further research into the digital divide after the National Telecommunications and Information Administration's initial inquiry (Bertot, McClure, & Fletcher, 1997; Bertot & McClure, 2000; Bell, 2001), several factors began to be apparent that affected the ability of a user to actually access the information on the Internet. The three primary factors were access

to technology, an infrastructure in place that supported the technology, and users' skill sets that allowed them to use this technology to their advantage.

Access to technology.

The first factor that was the impetus for the initial National Telecommunications and Information Administration study was that of access to technology. In the 1995 study, the main variable was whether a person had a computer with a modem. At that time, while modems were gaining in popularity, it was not assumed that a networking device, such as a modem, would be included in the system specifications that included network interface cards and modems to gain access to a local area network or wide area network. Today, while it is mainly assumed that a system has some form of network device installed, not all socio-economic groups can afford a computer. Thus, while the gap between computers that have connectivity and those that do not has been bridged, there is still a significant gap between people who have access to a computer at home and those who do not. Another shift from the 1995 study is whether a person had access to a computer. As of 1994, according to later research by the National Commission on Library and Information Science (NCLIS) only 20.4% of libraries had Internet access (McClure, Bertot, & Zweizig, 1994). However, by 1997, the study by the NCLIS found that 72.3% of libraries had Internet access (Bertot, McClure, & Fletcher, 1997), and by 2000, 94.5% of all public libraries in the United States not only had access to the Internet but also provided access to the public (Bertot & McClure, 2000).

The US Congress passed the Telecommunication Act of 1996, which was the first telecommunications legislation since the 1930's. This act was designed to reform the telecommunications, as well as information, landscape in the US. With the intervention

of Congress via the Telecommunication Act of 1996, libraries made tremendous gains in getting and sharing access to the Internet with the public. Specifically, libraries gained federal funding through the advent of the e-rate, which was included as a provision in the Telecommunication Act of 1996. The e-rate program was designed specifically to subsidize the cost of broadband internet access for schools and libraries. School and libraries can apply annually for funding that can range from 20 to 90 percent of the cost associated with gaining internet access (*E-Rate Program - Discounted*, n.d.).

The inclusion of the e-rate program helped to drastically offset the expense of Internet access and is still in use today to offset the cost of access to broadband for many public libraries. While by 2000, a person could enter almost any library in the United States and have a terminal that accessed the Internet, libraries failed to capture all of the population in their area of influence. Many rural libraries service a significantly large geographic space, thus limiting the ability of their patrons to visit the library. In addition, even those people who have a library nearby often do not take advantage of its resources. A number of users are unaware of these resources or often do not have the skills to use a computer to find the information that would benefit them. "Half the adults in America do not have Internet access and 57% of those non-users are not interested in getting online" with "36% of those not online express concern that the online world is a confusing and hard place to negotiate." (Lenhart, 2000, ¶ 5).

The focus of research began to shift from having any source of access to actually having a source of access that one would use. This often shifted the focus to a person's home and work environment. While the prices of PCs have dropped significantly since their debut, there is still a significant cost associated with a computer that will be relevant

for a year or two. While some areas have made inroads in trying to provide Internet service to the community for free, this is typically not the case. For most people, in order to access the Internet from home, they must have a subscription to a local ISP. As with many services, price ranges differ greatly, depending upon location, speed, and competition. Unfortunately, many of these ISPs rely upon nearby high-speed cables, which are typically not available in most rural areas. While some service providers are installing wireless connectivity, the process has been slow and costs are usually more than that paid for traditional wired service. This often leaves groups in lower socio-economic brackets left without the means to access the Internet. For example, one project of the FCC was to bring fiber optic to rural New Hampshire. Several ISP's, including Fairpoint, objected to government intervention in a free market. However, local residents state " that the DSL over copper lines was much slower than fiber to the home, and that FairPoint showed no signs of ever bringing anything faster to Rindge" while one resident pointed out that "getting rid all those other systems means his monthly connectivity charges have dropped from a total of $268 a month to "a little over $100." (Brooks, 2014).

Technological skill sets.

Another significant factor that has a considerable impact upon the digital divide and people's access to the Internet is a person's skill set. Oftentimes, many people fail to realize the impact of even being able to use a mouse effectively. Many people, especially those in older demographics or with less education, have not gained even rudimentary skills for using computers. Loading a program using a graphical interface is often an intimidating task, much less actually opening a web browser and finding a search engine

to run a query for specific information. Simple routines, such as including a Boolean operator in a search query, are often something outside of these people's ability to perform. Even if they can do a simple query, the relevance of the returns on their searches may be so low as to make them wonder why they tried to perform this operation in the first place. As of 2000, "87% of those 65 and over do not have Internet access and 59% of those between the ages of 50 and 64 do not go online. In comparison, 65% of those under age 30 have Internet access" (Lenhart, 2000).

As an additional obstacle involved in skill sets, researchers have found low levels of information literacy in even the most prolific groups of Internet users. Many users feel that if a query result is at the top, it must be the most relevant to exactly what they were looking for. In addition, many users do not look at the source of the information being provided or the age of the material that is available. Many websites may not be updated for weeks or months, if ever. Thus, the information presented on these sites may be outdated at best and completely erroneous or dangerous at the worst. Information literacy has become a topic of research in its own right, as many researchers have realized the importance of gaining a deeper understanding of the strengths and weaknesses of online resources and the ability to find scholarly works as opposed to many opinion pieces that have proliferated on the Internet. Ferro, Helbig, and Gil-Garcia (2011) stated, "While IT literacy is an important factor in digital divide research, and studies examine user characteristics with respect to IT literacy, few studies make the process of basic IT literacy acquisition their main focal point" (p.3).

With the phenomenal growth in blogs and wikis in recent years, the amount of information stored online is growing at a colossal rate. However, many of these pieces of

information are hearsay or a person's opinion. However, without an understanding of how websites are built and who can build them, a newcomer to the Internet may assume the information posted is completely correct or unbiased. This could lead to poor decisions based upon this erroneous or highly biased information. By learning more about being information literate, an Internet user would be equipped to at least be aware of the potential for bias and error on these websites and make sure that if the information they are using is not a scholarly work to look for additional sources of information to corroborate the accuracy of the information. "The Web has potential to fuel anxieties in people who have little or no medical training, and the large volumes of medical information, some of which is erroneous, may mislead users with health concerns" (Murphy, 2010, ¶ 7).

Information literacy, however, is often well past the point where many users are. Many users struggle with basic word processing and spreadsheet programs, such as those in the Microsoft Office suite. Even such simple exercises as opening a web browser may be foreign to them. Several researchers started studies on information searches only to discover that the respondents to their survey did not even possess the rudimentary computer skills beyond turning on their PCs (James, 2001a; Hargittai, 2002; Stern 2010).

As an additional challenge, if the user does not read English, he or she may be blocked from accessing the content due to the language barrier. In a 2006 survey, "32 percent of the websites loaded in English, fully 69 percent either loaded in English or offered English translations" (*Does the Internet*, 2006, ¶ 3). Therefore, a user has over a one in three chance of being unable to decipher the information even with access as it may not be in a language he or she can read. Many lesser developed countries do not

even have a presence online thereby denying support for the given language of their people. In 1997, researchers "found that English was the principal language on 82.3% of these pages, followed by German (4.0%), Japanese (3.1%), French (1.8%) and Spanish (1.1%)." (Grefenstette & Nioche, 2000, p. 1).

As an added challenge, many of the very people who would benefit the most from access to the Internet are illiterate, thus stacking the deck even further against them. According to the Central Intelligence Agency, "Extremely low literacy rates are concentrated in three regions, the Arab states, South and West Asia, and Sub-Saharan Africa, where around one-third of the men and half of all women are illiterate" (*The World Factbook*, 2013, ¶ 1). These are the very regions that would benefit the greatest from increased access to information.

Technology infrastructure.

A third factor that has been discussed in depth has been the need for the infrastructure to support access to the Internet. Many developed countries had a significant portion of their country wired via telephone lines. This cabling allowed earlier access to the Internet, as telephone lines were the primary method by which Internet connections were made to ISPs. Even the digital subscriber lines (DSLs) that allowed for even faster connection speeds were originally based upon the use of telephone lines. "The most popular way is to have your telephone line (also known as a 'landline') converted to broadband so that it can carry normal phone calls and internet data at the same time" (Syrett, 2013, ¶ 2).

Many lesser developed countries, however, have not had the opportunity or budget needed in order to extend copper lines throughout their countries. In addition,

numerous wars and conflicts have further slowed progress, as many areas that did have the necessary cabling in place were often some of the first targets in an insurrection, thus destroying what little infrastructure was in place at the time. Similarly, many lesser developed countries have very narrow methods of connection to the outside world. If those connections are damaged, this often has a huge impact of the entire country's access to the Internet. This was highlighted in 2009, when the SAT-3 cable connecting most of Nigeria to the Internet was cut: "Around 70% of Nigeria's bandwidth was cut, causing severe problems for its banking sector, government and mobile phone networks" (Cable Fault Cuts, 2009, ¶ 4).

Many countries have begun introducing computer skills into the education system. In addition, several groups, such as the One Laptop Per Child organization, have been working steadily to try to address the issue of having access to the technology required to use the Internet. However, the issue of infrastructure has been plagued with many problems that have slowed progress.

> Throughout Sub-Saharan Africa, clear limitations to productive Internet access and use exist, and overcoming them will require appropriate investment in both infrastructure as well as demand side factors such as access, affordability, awareness and attractiveness of solutions (noted as 'conditions for use'). Poor performance on these core conditions, comprised of indicators on physical infrastructure and general business environment, cannot be leapfrogged (*Impact of the Internet*, 2013, p.4).

One such issue is that of funding. Many of the very countries that would benefit the most from gaining access to the Internet are the very same countries that are unable to

afford the cost of the infrastructure needed to support access to the Internet. "Policy-makers should remove roadblocks that deter investment in and use of terrestrial fibre, including: lack of liberalisation; high cost of licences; challenges accessing rights of way for deployment within countries and across borders; and high taxes on equipment and services" (Schumann & Kende, 2013, p. 3).

As an added hurdle, while some companies often offer to install and maintain the needed infrastructure, those companies gain a monopoly on access to the infrastructure. In addition, any profits that are generated are typically moved out of the country.

> Currently, nearly all developing countries suffer from Internet connectivity that is expensive and slow, in comparison to developed countries. To a large extent, this is the result of the fact that virtually all developing country Internet networks and service providers rely - directly or indirectly - on international satellite links to larger foreign upstream providers (*BOLD 2003: Development*, 2003, ¶ 1).

These two issues have a significant impact on a country's ability to maintain long-term access to the Internet.

Another significant issue is the physical accessibility needed for the infrastructure. Much of the developing world, as well as many areas in developed countries, has a sparse population density. This leads to concerns about being able to even reach many of these groups, much less install cabling that would reach that far without a significant loss of signal strength. One method by which this obstacle is being addressed is by the use of mobile technologies. By installing wireless access towers on high viewpoints, ISPs are able to spread access to the Internet over a broader area without having to run physical lines to them, thus decreasing much of the cost of fixed lines.

However, adoption of this process is still slow. As the International Telecommunications Union stated,

> A number of developing countries have been able to leverage mobile-broadband technologies to overcome infrastructure barriers and provide high-speed Internet services to previously unconnected areas. In Africa, mobile-broadband penetration has reached 4%, compared with less than 1% for fixed-broadband penetration ("Europe Leads the Broadband," 2011, p. 5).

Is Internet Access Important?

One question that often arises is whether access to the Internet is important, as groups or individuals often only see the commercial side of the Internet and not the full gamut of opportunities that it can present in terms of educational opportunities. A number of non-governmental organizations agree that Internet access does have a significant positive impact on a society. The United Nations lists access to the Internet as an important portion of Goal 9 of its Sustainable Development Goals ("Goal 9. Build," n.d.). The United Nations indicated that,

> Many of the most effective development applications of ICT, such as telemedicine, e-commerce, e-banking and e-government, are only available through a high-speed Internet connection. But a significant divide exists between those who enjoy fast access to an online world increasingly rich in multimedia content and those still struggling with slow, shared dial-up links"(*The Millennium Development*, 2010, p. 72).

Research into the digital divide has been somewhat slow, especially in some of the developed countries. The initial definition of the digital divide focused on whether a

person had access to the technology or not. This definition has often been the focal point in much research as an agreed-upon starting point. However, this starting point often blinds researchers to other areas that have an impact upon the digital divide. By focusing on this singular issue, there have been several recommendations made about ways in which the divide could be addressed, such as providing low cost laptops to developing countries or donating slightly older technologies to developing countries. Unfortunately, these recommendations failed to address other issues that could also impact the digital divide. Boris (2005) quoted Schement, stating that "policy makers should concern themselves with the diffusion of Internet services and seek policies to support its widespread availability" (p. 307), adding "presumably rather than with providing the devices themselves." In addition, "As a 'public policy problem, the digital divide shifts from a matter of pure social inequality to a matter of strategic importance in a global race for competitiveness'" (Ferro, Helbig, & Gil-Garcia, 2011, p.3).

Knowledge Is Power.

Sir Francis Bacon said it most succinctly that knowledge is power (Bartlett, 2002). The Internet is currently the largest storehouse of knowledge that mankind has ever accumulated. In an article discussing the explosion of information, Vellante (2010) stated, "The amount of digital information grew 62% over 2008 to 800 billion gigabytes (0.8 Zettabytes)" (¶ 2). The amount of information being generated has never been seen before, and that amount continues to grow each year. However, for many governments, that very knowledge is one of the keys used to maintain power.

In China, the government keeps tight controls on the levels of access permitted to the average citizen. As part of its ability to do business in China, Google agreed to

modifications such that "the Chinese government blocks access to certain search results for users in mainland China" (Guynn, 2010, ¶ 11). By controlling what information that their people can see, the Chinese government is better able to control their decision making. By limiting what information is available, people are only shown one choice in what might otherwise be an involved discussion. In terms of the electoral process, if only one person is on the ballot, then it is easy to control who will win the election. In the case of information, if only one side is shown, it is easy to control how people will react to a given situation. The Arab Spring has been fueled by the distribution of information of the inequalities of the people and the ruling class in many Arab countries and how the people have risen up to change their country. By using the Internet as a focal point for disseminating information, dissidents were able to spread information quickly to a large number of people and gain a better level of organization for their movement than may have been available otherwise.

In an article on the Slate website, there was a discussion about how being online gave the people access to ideas that they may not have been exposed to previously. William Saletan is a political writer for Slate. During the Arab Spring, Saletan reached out to bloggers in order to discover how they located information and why they had begun to look for the information in the first place.

> Once online, he met bloggers outside Saudi Arabia, learned about politics, and developed an interest in human rights. He said the same thing has happened to other bloggers in the region. Merlyna Lim, a scholar of social transformation at Arizona State University, described a similar dynamic in Egypt: Young people

> went online to keep up with their friends and youth culture. In doing so, they became politicized. (Saletan, 2011, ¶ 4).

In addition, Saleton (2011) wrote,

> In Tunisia, according to exiled blogger-activist Sami Ben Gharbia, the government blocked YouTube and Flickr but didn't block Facebook because too many Tunisians had already gathered there, and cutting them off seemed too risky. As a result, more Tunisians converged at Facebook, which became the hub for mobilizing the rebellion (¶ 5).

Democracy

One of the factors that may have an impact on the digital divide is democracy. Does freedom allow for greater levels of access or do we see similar levels of access even in those countries that are not considered as free or do these less free countries allow even more access?

Democracy is defined as "government by the people; a form of government in which the supreme power is vested in the people and exercised directly by them or by their elected agents under a free electoral system" (*Democracy*, n.d.). A truly democratic country is one that listens to its citizens and allows them to vote, directly or via representation, on the major issues that affect their society. As Kim et al. stated, in the case of local elections, the winner of the election is often based on preference rather than an actual informed decision. This uninformed decision then has a social impact as well. Therefore, the digital divide has not only an impact on an individual life, but on society as well (Kim, Lee, & Menon, 2009).

Therefore, it would stand to reason that a democratic country would want the greatest levels of access to information, so that the people could make the most informed decision available. However, no studies have looked for such a link. As Bertot (2003) said succinctly, "The foundation to a democratic society is free and unencumbered access to information" (p. 186). While some studies have looked at some of the major factors discussed and debated, many other factors have been left out of the discussion. However, the digital divide continues to grow even as more research is done to try to address it. As more research is done, more factors are brought to light that have an impact on the divide and change the way future researchers approach it. James (2008b) discussed the difficulty of closing the digital divide due to the fact that the equation being used is flawed. He stated that previous analysis of the digital divide approached technology access, skill set, and infrastructure as being an additive process. Thus, a country could offset a weak area by increasing its score in a different area. James argued that this is not the case as seen when there is an absence of one of these factors. If a country has no infrastructure needed to access the Internet, then no amount of technology will be able to offset that. James stated that the equation to measure the divide needs to be a multiplicative one, reflecting the realities of being shut out of access if any of the major factors are not available. This has been demonstrated throughout Africa, as many countries simply do not have the infrastructure in place to support the technology being adopted.

Policy analysis research has begun in an attempt to address the digital divide. However, not much headway has been made in this regard. One issue is that the initial attempts often look at different variables or only at the level of technology itself as discussed by Çilan et al. In an article by Çilan et al. (2009), the discussion on the digital

divide and policy is focused only on member and candidate countries of the European Union. As they stated, "Previous studies in this area focused primarily on measuring the level of Information Technology/Information Systems (IT/IS) utilization in different countries, and very few focused on the digital divide itself" (Çilan, Bolat, & Coşkun, 2009, p. 101).

The digital divide is a complex issue that has gone far beyond the initial study of whether a person had access to a computer that had a modem or not. However, many facets of that complexity are still unexplored. As a researcher begins to gain a grasp of one area, he or she often realizes that there is a whole new dimension to the problem that has not been explored. In the case of the digital divide, researchers are seeing finer distinctions and more variables that impact the divide. This has been exemplified by research on the digital divide, as the initial studies focused simply on access to technology. However, as time passes, it was discovered via research, that other factors played an important role in the divide as well. These include such ideas as skill sets, education, and socio-economic status.

As technology continues to accelerate at a faster and faster pace, the effects on the digital divide continue to grow. For example, as connection speeds have increased, many technologies have fully embraced those new speeds. However, for a person still using a dialup connection, perusing a database based on the assumption that the user has a high-speed connection is a painful and frustrating experience. If the exercise was not a required one, such as for work or class, the user would probably decide that the information was not worth the hassle required to get to it.

E-Government.

In recent years, a large number of governments have begun moving towards an e-government model. This model entails making more of their resources available online and sometimes exclusively online. While this model is typically a cost-savings model for the government, it often locks a person out of government affairs if he or she does not have access to these digital resources.

Many governments also use their online tools as a method by which to communicate to their citizens and keep them up to date on the decisions being made by their representatives or leaders. However, this often leaves many of the people unable to keep up with this news as they do not have online access. They are also often unable to make informed decisions when it comes to choosing new leaders or representatives, as currently most information is posted online. As Kim et al. stated Internet users seek out more new sources each day than those with slow or no internet access. This allows Internet users to gain more information about key issues and make more informed decisions in their daily lives (Kim, Lee, & Menon, 2009). By these numbers, a person with high-speed Internet access uses almost twice as many sources for information than a person without access to online resources.

Hirwade (2010) said that by providing resources electronically, such as government information and services, a wider audience can be reached and greater levels of transparency can be achieved. In addition, citizens can access these resources at more convenient times that fit their schedules and gain greater opportunities to participate in government decisions.

In addition to providing a tool for use by the citizens, ICTs also provide a tool for the legislature that enables the representatives to communicate better with their constituents and keep them informed of the issues that are being debated. As Griffith (2010) said, "More members, party leaders and senior administrators have begun to understand the potential of new technologies to enable legislators to fulfill their legislative, oversight and representative roles in much more effective ways than in the past." Griffith also stated that by using technology to manage information, governments can operate more efficiently and effectively by allowing greater levels of transparency to hold governmental officials accountable (Griffith, 2010).

In addition, this new form of governance adds additional levels of transparency that would help to reduce corruption that is often rampant in many developing countries. According to Bertot et al., "ICTs can reduce corruption by promoting good governance, strengthening reform-oriented initiatives, reducing potential for corrupt behaviors, enhancing relationships between government employees and citizens, allowing for citizen tracking of activities, and by monitoring and controlling behaviors of government employees" (Bertot, Jaeger, & Grimes, 2010, p. 265). One example is seen in the E-Mexico website, "In 2002, a team of journalists searched *Compranet* and discovered authorizations of more than US$1 million for upgrading the presidential residence, including US$500 bath towels—this lead to "Towel–gate," the first major scandal of the Fox administration (Scheeres, 2005)" (Curry & Kenney, 2006, ¶ Mexico's government and the Internet). Researchers Curry and Kenney found that "Using the Internet for government-citizen exchanges is not only potentially more efficient, but also eliminates

direct contact, which provides the opportunity to solicit bribes (Curry & Kenney, 2006, ¶ Conclusion).

E-government also directly affects democracy, hence its importance to this study. Schuppan (2009) stated that e-government is not only focused on providing service but also allows greater levels of participation within the government, thus strengthening a democracy.

E-government allows for an additional method by which citizens can keep track of their government and the decisions it is making. Schuppan (2009) also stated that ICT's allow new methods of participation which contributes to greater levels of legitimization of the government. Such participation can include feedback on budgetary decision or on land-use plans (Schuppan, 2009).

Next Steps

The direction of this study was to build a multivariate regression model that ties together the concepts of democracy with those concepts of access to information. This study discovered whether a relationship exists between those variables, and if so, how strong such a relationship is.

The basis of the model for democracy will be the Freedom House scores of democracy. Freedom House ranks every country in the world based upon survey data encompassing two primary categories: political rights and civil liberties. These two categories then are weighted in order to determine the status of a country**. "**The status designation of Free, Partly Free, or Not Free, which is determined by the combination of the political rights and civil liberties ratings, indicates the general state of freedom in a country or territory" (*Introduction*, 2011, ¶ 2). The two categories, political rights and

civil liberties "contain numerical ratings between 1 and 7 for each country or territory, with 1 representing the most free and 7 the least free" (*Introduction*, 2011, ¶ 2).

Freedom House was chosen as the primary source due to its status as a non-governmental organization (NGO), which would keep it from being biased by its parent country. In addition, Freedom House has been in existence for 70 years, lending historical weight to its status as a data provider. Freedom House's list includes 194 countries and 14 territories, making it one of the most comprehensive lists available.

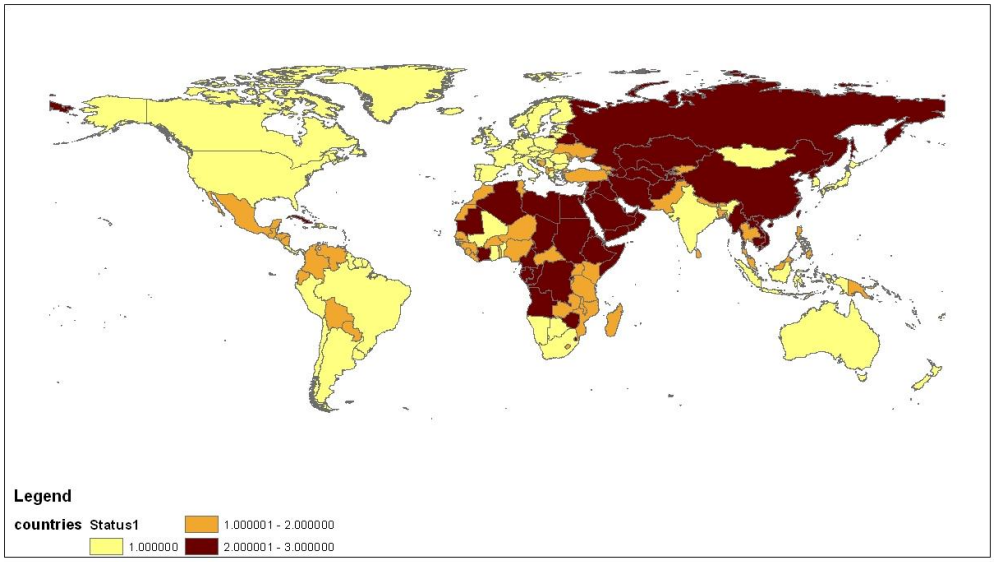


Figure 1.1 Freedom House world freedom status rankings

Freedom House World Freedom Status Rankings

As shown in Figure 1, while most developed countries are in the Free rankings, many developing countries are in the Not Free rankings. This may have an impact upon the ability to gain access to information and what that access looks like. Many countries that are ranked as Not Free but do possess significant access often have that access limited or filtered in some manner. As previously discussed, as the unrest in Tunisia took place, the government authorities began to shut down many forms of access to social

media in an attempt to curtail the spread of information. However, they left Facebook open due to its significant popularity, which was then used as the primary means of coordination between groups.

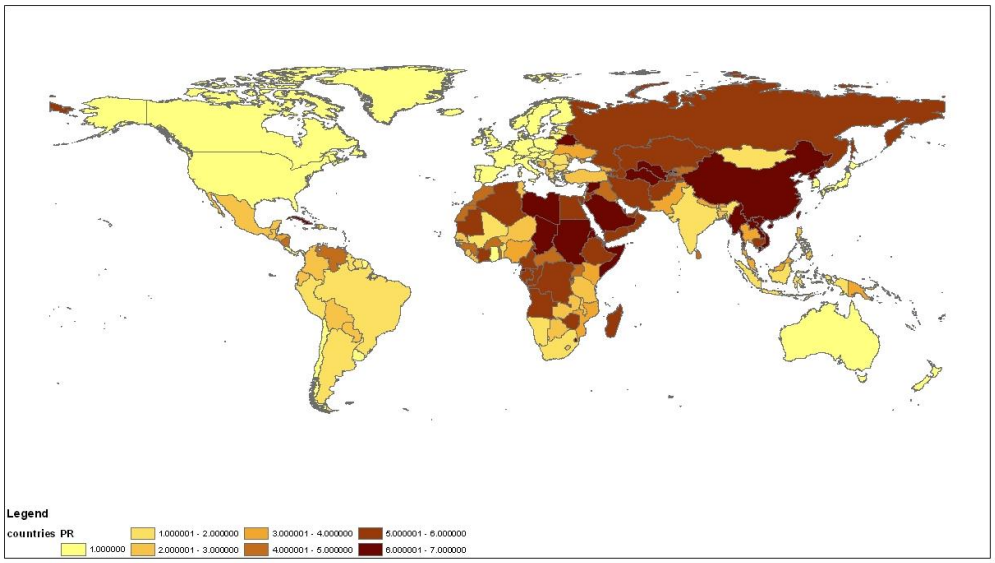


Figure 1.2 Freedom House world political rights rankings

Freedom House World Political Rights Rankings

Political rights rankings are also an important indicator when it comes to digital divide issues (Figure 2). As a country gains greater levels of freedoms, it would stand to reason that greater levels of access to information would be desired in order for the citizens of that country to make more informed decisions. Based upon the rankings of political rights, most developed countries rank the best in comparison to the rest of the world. However, does this political freedom translate into greater levels of access?

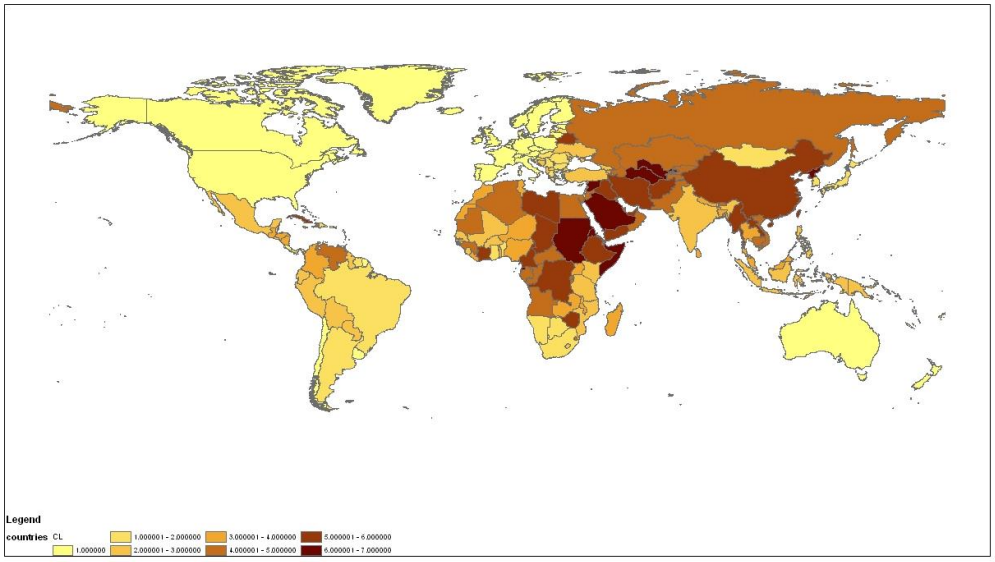


Figure 1.3 Freedom House world civil liberties rankings

Freedom House World Civil Liberties Rankings

Civil liberties also form a crucial element in the levels of freedom and democracy in a country. As shown in Figure 3, most of the developed world ranks high in civil liberties. However, do these liberties translate into access? Do countries that give their citizenry greater levels of latitude in their civil abilities also give it greater levels of access above that possessed by those countries that are ranked lower in their civil liberties? As Freedom House stated:

> The political rights questions are grouped into three subcategories: Electoral Process (3 questions), Political Pluralism and Participation (4), and Functioning of Government (3). The civil liberties questions are grouped into four subcategories: Freedom of Expression and Belief (4 questions), Associational and Organizational Rights (3), Rule of Law (4), and Personal Autonomy and Individual Rights (4). (*Introduction*, 2011, ¶ 11)

Accessibility

In the digital divide, the primary means of access to online information is obviously by using an Internet connection. As part of its Millennial Development Goals, the United Nations began to track the estimated number of Internet users in each country.

> The Millennial Development Goals are the world's time-bound and quantified targets for addressing extreme poverty in its many dimensions-income poverty, hunger, disease, lack of adequate shelter, and exclusion-while promoting gender equality, education, and environmental sustainability. They are also basic human rights-the rights of each person on the planet to health, education, shelter, and security"("What They Are," 2006, ¶ 2).

The UN's approach was that Internet access can be used to further the development of a country and aid it in battling poverty. The UN took such a strong stand on the topic of Internet access that it labeled this access as a basic human right. In a recent statement on the Arab Spring,

> The United Nations counts Internet access as a basic human right in a report that bears implications both to on-going events in the Arab Spring and to the Obama administration's war on whistleblowers. Acting as special rapporteur, a human rights watchdog role appointed by the UN Secretary General, Frank La Rue takes a hard line on the importance of the Internet as "an indispensable tool for realizing a range of human rights, combating inequality, and accelerating development and human progress (Estes, 2011, ¶ 1).

In addition, the UN Secretary General stated that blocking access to the Internet should not be used as a method to prevent debate and that a government should

respect an individual's right of free expression and free assembly using whatever methods they have available, including digital methods ("UN Against Censoring," 2011, ¶ 1).

As a method by which to measure levels of access, the dependent variable to be tested against the variables based on freedom will be that of number of Internet users per country. While this number is somewhat questionable, no other international body is tracking this number in detail. Thus, the number of Internet users proposed by the UN is currently considered one of the better choices.

These data can be obtained through the International Telecommunications Union (ITU): "ITU is the United Nations' specialized agency for information and communication technologies—ICTs**"** (*Overview*, 2008, ¶ 1).

Moreover,

> ITU is committed to connecting all the world's people—wherever they live and whatever their means. Through our work, we protect and support everyone's fundamental right to communicate. Today, ICTs underpin everything we do. They help manage and control emergency services, water supplies, power networks and food distribution chains. They support health care, education, government services, financial markets, transportation systems and environmental management. And they allow people to communicate with colleagues, friends and family anytime, and almost anywhere (*Overview*, 2008, ¶ 1).

ITU is considered to be the world's foremost experts in research on Internet access. Its current membership consists of 193 countries, academic institutions, and over 700 private companies. All of these organizations work to "develop the technical

standards that ensure networks and technologies seamlessly interconnect, and strive to improve access to ICTs to underserved communities worldwide" (*Overview*, 2008, ¶ 1).

By reviewing these data procured from a variety of non-governmental sources, it is hoped that as little bias as possible will be introduced into the model. In addition, by using a variety of data sources, any bias that is introduced by a single source should be kept to a minimum. While this data is secondary data, it is the best available.

Bridging the Divide

While this model will not solve the problem of the digital divide, it will give other researchers additional insights into some of the variables that affect the digital divide and that impact the amount of access that certain groups have to information. While no single study will solve the digital divide, as each researcher takes an aspect of it and learns more about it, over time, each of these insights will begin to build upon one another and allow for specific policy suggestions to be made that will have a direct impact in bridging the divide.

By reviewing the research currently being done, leaders of developing countries could make better budgetary decisions about where to invest their governments' funds as they try to improve their countries. By looking at which issues, if solved, would provide the best return on the investment, these leaders can begin to build comprehensive, long-range ICT programs that make deep inroads into addressing digital divide issues within their countries.

While the path to finding a solution to the digital divide will be as long and taxing as that required addressing other social issues, such as illiteracy, there is still hope that it can be addressed. As more information is published in digital formats, as more museums

and libraries digitize their collections for outside use, and as more journals adopt a completely digital format, the push for greater levels of access will increase among those on the wrong side of the digital divide. As it becomes apparent that ICT growth helps to spur development, many more developing countries will begin to work on long-term ICT growth plans in order to reap the benefits, financial and otherwise, from those investments.

As more people gain access to information, this may have an even more profound effect, as seen by the recent events surrounding the Arab Spring. As people begin to realize the power that they possess as individuals and find ways to use information to leverage that power towards change, the face of the world as we know it could begin to change for the better. As people begin to see that they can band together to make changes in their governments, whether it be local, national, or international, more groups will begin to do so in order to make the world a better place for not only themselves but also for the future.

Technology has provided people with tools that have made profound impacts on our society, from the introduction of papyrus to the distribution of the PC. Technology will help us to gain a better understanding of the ways our universe works and give us the ability to reach beyond what our eyes can see and into areas that our imaginations can barely comprehend. Yet, for those without the access to this technology or the ability to use it to its potential, it is another object taking up space on a desk that is already overloaded. Denying any group access and the ability to know how to use that access also denies them the most precious of commodities—the hope for a better future.

The fundamental question of this study is whether the level of democracy a country possesses affects the digital divide and whether a person in a country considered free has greater levels of access to information than a person in a country considered not free. The hypothesis for this study is that there is a statistically significant relationship between levels of freedom and access to online information. The statistical methods used will test this hypothesis, as well as indicate the strength of the relationship.

The limitations of the study include several factors, such as the use of secondary data as the primary source of variable data for the regression model. In addition, the data being used are repurposed data, as the original purpose of these data was not to ascertain the relationship between the variables used in the regression model. Another limitation is that statistical methods are not 100% accurate, although accuracy levels of 95% or more are not uncommon. Finally, while every measure has been taken to ensure accuracy, there is always the opportunity for human error to enter into an equation.

CHAPTER 2

A BRIEF HISTORY OF THE DIGITAL DIVIDE

The concept of the digital divide has begun to be researched in greater depth as society becomes more interconnected. As society begins to realize the full potential of this interconnectedness, it has also begun to realize that this connectivity was not all inclusive. A larger number of lower socio-economic groups have been left out, thus often causing their voices to be left out. In addition, as technology has expanded, greater levels of granularity have begun to be researched as those with high-speed connections have a significant advantage over those Internet users using slower connections, such as a dial-up connection.

The preliminary discussions about the digital divide were much more broadly based, as the Internet had not gained such a significant foothold. The initial factor discussed was whether someone had access to the Internet, regardless of how that access was achieved. However, throughout the literature, a number of themes emerged that encompassed most of the research that had been done up to this point. While some of these themes were fairly specific, such as the physical infrastructure available in a country or the skills possessed by citizens within a country, a number of them, such as definitional work, were somewhat broad. However, even though a significant amount of research has been done, there are still significant gaps in the information currently

available. In this chapter, the current research will be discussed, and the gaps in the research will be highlighted.

While a number of authors disagreed on various topics, very few disagreed over whether the digital divide actually exists or the importance of discovering the variables that affect the divide as well as ways to bridge the divide.

Categories and Themes

Over the course of this literature review, each resource was analyzed and a main theme was identified. These resources were then separated based upon their overarching theme. However, many of these resources did have a significant amount of overlap in terms of their discussion points, research question, literature review, and findings. Therefore, while each resource is primarily included in a specific category, this does not indicate that the resource does not also contain relevant information for other themes as well.

After an intensive review of the current literature, a number of themes became visible. These themes varied from somewhat broad, such as those resources primarily discussing the definition of the digital divide and ways to quantify that definition, to articles that were much more focused, such as articles discussing social inclusion and the effects that the digital divide is having upon that inclusion or lack thereof.

As James (2008b) stated, the digital divide can be defined by analyzing the variables of human capital, skills, and infrastructure. Utilizing this definition gives a structure by which to contain the subthemes presented in much of the literature. This assumption works well in terms of grouping the vast amount of information into similar categories and building upon each to highlight its strengths and weaknesses. In addition

to these three main categories, a fourth category was added based upon articles that were primarily focused on defining the digital divide. This definitional category was important in order to give a starting point for the literature, as well as verify that all of the articles included were using the same sets of assumptions in describing digital divide issues.

The category for definitional articles included articles that tried to define what the digital divide was and its impact on society and specific socio-economic groups. In addition, articles discussing the variables that have been discovered to affect the digital divide and the search for others were also included in this category.

The category for skills includes articles involving the following themes: digital divide and e-government, libraries, the divide and education, and skills or the lack thereof. The category for infrastructure includes articles involving the following themes: open-source materials and their effects on the divide and ICTs. Finally, the category for human capital includes articles involving the following themes: social inclusion, rural versus urban environments, a focus on people, and democracy and the divide.

Categories

Definitional. The initial research done on the digital divide was based upon trying to define the divide. This discussion continues today as researchers have begun to realize the level of impact that the digital divide has on a population. The initial definition was someone who had access to online resources through the use of a computer with a modem (McClure, Bertot, & Zweizig, 1994). Today, the divide has become more granular, including subdivisions for those with access and their type of access (broadband or narrowband), whether access should be based on access from anywhere or only from home, and whether it is more of a policy concern than a technological one.

Another overarching theme that was present in the literature was research into the variables that affect the divide. The initial research in the United States was based on whether a person had a computer and, if so, whether that computer had a modem. Today, research includes reviewing variables such as age, socio-economic status, education, infrastructure availability, and more. Even now, researchers continue to discover more variables that have a significant impact on the divide and those with or without access to online resources. One such example is the available amount of broadband within an area or region and its impact on increased investment by businesses (Brooks, n.d.). Also included in this research focus were discussions on the digital divide not only between countries but also within countries by reviewing variables that could affect a country internally (Çilan, Bolat, & Coşkun, 2009, p. 99).

Skill sets. In terms of skill sets, the lack of skills in using Internet technologies was also a theme that encompassed a number of articles. One of the concerns often discussed while defining the digital divide was the need for skills as part of the definition. In today's world, there are a significant number of voices talking through online mediums. A user with no background in vetting all of this information is more likely to be misdirected than a more experienced user. For example, the ability to recognize authoritative sources or to recognize that some web addresses, such as those with an .edu domain are typically more reliable than a .com domain. In addition, users without the proper skill set to fully utilize online resources are often presented with an additional barrier to entry and participation in the online discussion, whether it is in terms of government participation or ICT investment in their area.

Another main theme that became apparent through the review of the literature was that of the use of e-government. In an effort to cut costs, many governments have begun to shift many of their resources into a digital format. For many of these resources, this is now the only method by which the resources can be accessed. A number of researchers, including Helbig, Gil-García, & Ferro, discussed the beneficial impact of e-government, but also the threat of excluding many groups from being able to participate in government due to their inability to access online resources. The inclusion of e-government in the section on skills was partly due to the fact that, without the necessary technology skills needed to access this material, even the best-built websites will be significantly underutilized if the citizens within a country do not have the necessary skill sets to capitalize on its use. These skills include concepts as computer literacy, information literacy, and general searching skills.

An additional theme that was involved with skills was the impact of the library on the digital divide and the impact of the divide on the library. This was included in the skills category as the library is often the forerunner in teaching people the skills needed in order to capitalize on the materials and resources available online. With the advent of the e-rate in the US, libraries were mandated to allow public access to the Internet. In addition, libraries offer a number of programs aimed at educating their patrons in best practices in using the Internet. Also, in the U.S., public libraries are one of the cornerstone institutions in the battle to bridge the divide. However, libraries are often not funded adequately enough to make significant inroads in addressing digital divide issues in the very areas that need help the most. In addition, libraries are often burdened with

additional restrictions, such as filters, that add an additional level of inequality between users who have access at home and those who do not (Callison, 2004).

Another theme that was discovered was that of the digital divide and education. Education impacts and is impacted by the digital divide. Many researchers have reviewed both sides of this interdependent relationship in order to discover ways to address the divide. Public schools are another cornerstone in battling the digital divide in the U.S. as mandated by the Telecommunications Act of 1996. Yet, similar to libraries, schools are often burdened with additional restrictions, such as filters or a lack of access to equipment, which further exacerbates the digital divide. This has an impact throughout a student's academic career, including secondary education (Brown, 2002; Jones, 2002; Eamon, 2004).

Infrastructure. One theme for infrastructure that emerged was the impact of open-source materials. Open-source materials are those where the author or copyright holder allows anyone to freely access and use their material (*Open Collaborative Design*, n.d.). While many groups may have access to the Internet, many of the most useful resources are gated. These gates are often fee-based subscriptions, which are then a significant barrier to entry for many developing countries (James, 2003; Björk, 2004). The cost of Internet access alone is often a significant expenditure for a person or an institution. An additional cost for access to the information is often an insurmountable burden. This lack of access further fragments the divide, not only between those with access to technology and those without it but also between those with access to certain resources and those without it (Usova, 2009; Herb, 2010).

An additional theme that emerged was the discussion on ICTs and their impact on the digital divide. Part of defining the divide has included a focus on the physical infrastructure, or lack thereof, that a country or group possesses. Many authors are concerned that investment into ICTs is viewed as the best method to address digital divide issues without looking further at the specific community or groups being affected by that decision (Law, 2004; Haider, 2007; Usova, 2009; Herb, 2010). In addition, ICTs have been found to actually exacerbate social inclusion issues rather than help to solve them, such as participating in discussions that have moved to completely digital formats or debates on the current political candidates.

People. Social inclusion was another overarching theme that was prevalent in many articles discussing the digital divide. A number of articles were concerned that the divide was exacerbating many of the issues that individuals in lower socio-economic groups were already struggling with (James, 2001a; LaRose, Gregg, Strover, Straubhaar, & Carpenter, 2007). Today, many employers only accept applications for jobs through their online resources. This is a double blow for many individuals as they neither have the access needed to use such resources nor do they have the skills necessary to use those sites even if they were able to gain such access. These skills include computer literacy skills, knowing how to make the computer do what you want it to do, and information literacy skills, knowing which sources of information are authoritative and which may simply be opinions. In addition, many groups, such as older individuals, have additional barriers that are often overlooked, such as the lack of exposure to the technology that is often prevalent in younger people's daily activities. "Today's teenagers grew up with digital machines and — to a certain degree — with many binary options, with a visual

culture of images and their rapid procession." While "the elderly are more used to reasoning, systematic and logical thinking, linear step–by–step processes which are good for formal learning but turn out to be an obstacle when dealing with new technologies" (Paul & Stegbauer, 2005).

Another theme was a discussion between rural and urban users. Even in developed countries, rural users are often at a significant disadvantage compared to their urban counterparts. Most rural areas do not possess the infrastructure needed for broadband access, forcing them to rely on significantly slower methods to use online resources. In addition, rural communities are continuing to fall even further behind in terms of access and speed in relation to urban communities (Hollifield & Donnermeyer, 2003). While Malecki (2003) did discuss how rural communities can greatly benefit from the application of ICTs to diminish the effects of distance, even his article acknowledged the issues, such as points of presence and digital telephone switches that rural areas must overcome in order to begin to catch up to their urban counterparts.

An additional theme was a focus on people and what they needed for their lived experience. Some authors, such as Loosen (2002), discussed educating people on the fact that while their access may be "free," there is still a cost associated with that information. In addition, some authors, including DiMaggio, Hargittai, Neuman, & Robinson (2001), discussed a more focused response to the digital divide with an emphasis on specific groups' and communities' needs rather than a one-size-fits-all approach that is typically touted.

Democracy. This was the final theme that was prevalent in the literature. This was a theme that was approached in a number of ways, although no articles followed

through with work similar to that presented in this paper. Most of the research, such as that done by Herb (2009), Moss (2002), or Webster (1999), focused on whether the digital divide affected democracy and the democratization of a country or area. While many of the articles looked at the broader picture, most looked at qualitative factors. This gap in quantitative research presents an opportunity to review democratic variables that impact the digital divide on a global scale. While most research looks at the effects of the digital divide on democracy, very few review the effects of an open society on levels of access to information.

Conceptualizing the Digital Divide

The preliminary study of the digital divide in the United States was commissioned by the National Telecommunications and Information Administration. This study, *Falling Through the Net*, sought to see where the lines of the digital divide fell in order to find the most appropriate methods to address this divide between those who have access and those who do not. The initial findings indicated that

> Generally, the less that one is educated, the lower the level of telephone, computer, and computer-household modem penetration. For a given level of *education*, however, central city households generally have the lowest penetration for both telephones and computers, while rural households with computers consistently trail urban areas and central cities in terms of modem penetration. (McConnaughey, Nila, & Sloan, 1995)

The basis of the survey was whether a household had a computer and, if so, whether that computer had a modem installed.

An additional factor that was included in this research was whether the household owned a telephone. The telephone access question was an important aspect of the research at the time, since in 1995, Internet access for households consisted of using dial-up access. While other forms of access were being developed, they were typically not available on the open market. Thus, the telephone was the only option for gaining access to the Internet.

This initial survey was fairly simplistic in its approach. Due to the infancy of the Internet as a resource for all people, the concept of providing access to everyone was only slowly becoming a policy issue. As stated in the article,

> The broad policy implications for these findings should not be overlooked. By identifying those who are truly in need, policymakers can prudently and efficiently target support to these information disadvantaged. Only when this point is reached can *all* those who desire to access the NII (National Information Infrastructure) be possibly accommodated. However, connectivity to all such households will not occur instantaneously; rather, there is a pivotal role to be assumed in the new electronic age by the traditional providers of information access for the general public—the public schools and libraries. (McConnaughey, Nila, & Sloan, 1995)

This idea of using traditional information providers had already been suggested by the National Commission on Libraries and Information Science (NCLIS) a year earlier in its report titled *Public Libraries and the Internet: Study Results, Policy Issues, and Recommendations*. This report, authored by Charles McClure, John Carlo Bertot, and Douglas L. Zweizig (1994), was the first of an ongoing series of reports concerning the

ability of libraries to provide access to the Internet. McClure and Bertot (1997, 2000, 2005), along with various additional authors, wrote several follow up reports. The NCLIS report was initiated at the Library of Congress at a policy meeting, where then Vice President Al Gore began a discussion concerning the digital divide and whether public libraries could be used as a safety net to assist those groups that had no other means of accessing online resources (McClure, Bertot, & Zweizig, 1994, p. 2). This initial report had dismal news in regards to the level of accessibility available through libraries to the Internet. The initial report showed that only 20.9% of all public libraries were connected to the Internet. An even smaller number of libraries made that connectivity available to the patrons of the library. This lack of access raised concerns about how these excluded groups could gain access to online resources.

The Internet had already become known as an incredible source of information that could bring additional benefits to those that were able to access it. However, it was obvious that socio-economic factors limited many people's ability to access the Internet. The cost of computers alone often put accessibility well outside of their reach. Moreover, the additional fees incurred by factors, such as the cost of the phone line and the monthly fees for using an ISP added an additional barrier to entry. As stated in the New York Times, "the problem is about affording unregulated high-speed Internet service — provided, in the case of cable, by a few for-profit companies with very little local competition and almost no check on their prices" (Crawford, 2011).

These initial findings highlighted the fact that, while some libraries did provide access to the Internet, this was the case in less than one in five public libraries in the United States and was typically available in those areas that already had the greatest level

of Internet adoption in households (McClure, Bertot, & Zweizig, 1994). This helped to underscore the fact that access to the Internet was sporadic at best and that those groups that would benefit the most from access to the Internet are also the groups with the least amount of access.

Since these initial studies, the concept of the digital divide has grown and expanded. This greater awareness has been achieved as to the benefits of Internet access and the costs of not having such access. The Library and Information Science (LIS) field has been particularly focused on research on the digital divide, primarily since libraries are often seen as one of the primary means to narrow the divide.

Bertot et al. continue this line of studies with many of the same themes emerging throughout the years. The primary change that occurred is that libraries began to adopt technology at a faster pace and gained levels of access at a phenomenal speed, thus shifting the discussion away from providing libraries with access and more toward a discussion on what that access looks like and how it is being used. Concepts of increased e-government use through libraries, both nationally and internationally, began to emerge through the studies, especially as more agencies moved to a completely online format (Bertot, Jaeger, McClure, Wright, & Jensen, 2009; Mutula, 2005).

Definitional

Construing the Digital Divide

The digital divide has been defined in a number of ways. The initial definition in the United States was based upon whether an individual had a computer and, if so, whether that computer had a modem. As research has evolved in regards to the digital divide, so too has the definition. In addition, many researchers use their own specific

definition as the basis for their research. Each definition has made profound changes on what is being studied and what recommendations are being made to help narrow the divide. As the definition has widened, the boundaries of simple technological determinism have faded and discussions have begun to include societal and individual factors (Lynch 2000; Gurstein, 2003).

Some authors discuss how technology itself is not necessarily valuable, but what that technology gives users access to is valuable. However, if a person does not see the value of that access, then it will go unused. It is stated that knowledge is what is truly important, but the focus on access has occluded the argument (Fallis, 2004). This argument is succinctly stated that "Simple quantities of information are often irrelevant to its value" (Foster, 2000, p. 442). This was a fundamental shift away from the initial definitions based solely upon access to technology.

The initial conclusions from the original research were to provide access to the technology. However, as further research was done, this conclusion was found to be lacking (James, 2001), and the discussion shifted to one about technology access and teaching users the skills necessary to make the most use of the resources to which they have access (Dewan, Ganley, & Kraemer, 2005). In addition, the focus on ICTs is too narrow and detracts from the argument on the digital divide (Warschauer, 2000; Lor & Britz, 2007). Financial barriers were no longer seen as the only obstacles to accessing information, as governmental barriers also kept information from being readily available to the population.

Some authors, including James (2008), Jung, Qiu, & Kim (2001), and Gurstein (2003), define the digital divide based upon four pillars of an information society:

content, physical infrastructure, ICTs, and human capacity. While the initial idea of technology still plays a significant role, it is not the only factor for bridging the divide. However, others, such as Vehovar, Sicherl, Husing, & Dolnicar (2006), use the traditional factors of infrastructure, skill set, and access to technology in order to measure the digital divide. Each of those three variables is given a specific score, typically from 1 to 100 which is then added together to form an overall score for a country. However, current research has begun a discussion about whether this additive formula is actually relevant to the discussion or whether it should be changed to a multiplicative formula. The argument for this change is that a country can manipulate its score by significantly increasing one of these factors, while the other factors greatly lag behind. By using a multiplicative formula, the rating for a country would reflect a substantially lower score much more so than an additive formula (James, 2008).

Another concern with defining the digital divide is exactly what variables to use while trying to determine a way to measure it. This measurement is one of the major points of contention while trying to define exactly what the divide looks like. The discussion on measurement has seen many researchers build their own models in order to remove some bias from many of the standard models currently being used. James discusses a method where in scores are multiplicative rather than additive, which forces countries to work on all measures rather than just greatly strengthen one aspect (James, 2008). One of the primary concerns is that some of the factors, such as the availability of infrastructure, being used in some of the indices are added to the score, even though their impact is already included as part of other measurements. This double counting often raises the scores of many countries that are actually in worse shape than is indicated by

their score. An additional concern in measurement is that the tools being used are Western constructs, thus introducing a Western bias into the model being used (James, 2008; Jung, Qiu, & Kim, 2001; James, 2007).

Another concern in defining the divide is that the frame of reference being used often changes how the divide looks, thus changing the types of measurements that need to be made. For example, an international study often looks much different than one for a single country as the divide changes significantly when looking within a country or comparing countries, especially when using the same tools for measurement. This concern for some standard form of measurement has often muddied the argument in terms of how poorly a specific country may look (Corrocher & Ordanni, 2002; Vehovar, Sicherl, Husing, & Dolnicar, 2006; Barzilai-Nahon, 2006; Çilan, Bolat, & Coşkun, 2009). Many authors continue this discussion by describing ways that the divide can be measured differently by using different variables that have a significant relationship to the divide (Selwyn, 2011; James, 2005; Sciadas, 2002).

Included in the discussion on defining the divide are also some methods by which it can be addressed. While no author has claimed to be able to solve the divide itself, many have postulated methods to decrease the divide based upon how they define the divide. Many authors state that one of the primary tools to combat the divide is through increased policy changes. These authors include Billon, Marco, & Lera-Lopez, 2009, Shuler, 2007, and Verdegem & Verhoest, 2009. These policy changes include "deregulation, liberalization, and competition measures in telecommunication infrastructures and services as well as attractive prices through flat-fee subscription models and local subsidies in urban areas" (Billon, Marco, & Lera-Lopez, 2009, p. 608).

These policy changes are meant to encourage ICT growth and increased levels of affordable access as well as greater opportunities for market forces, such as increased competition, to work to increase quality.

Variables to Address the Divide

While the digital divide itself is challenging to define, it becomes even more so when actual variables began to be included in the models used to measure the divide. The initial NTIA study was based upon only two factors, 1) whether a person had a computer and, 2) if so, whether that computer had a modem. It became obvious very quickly as researchers began to study the divide that this model was exceedingly simplistic in its approach. Many authors began to discuss going beyond simple technology access and including innovation as a key component of digital divide issues (Drori, 2010; Baker,2001). Technology is allowing those with access to it much greater possibilities for innovation and thus much greater avenues for economic gain (Drori, 2010). This is reflected in the significant increase in patents being issued in countries with much higher ICT growth. This is discussed in the study by Çilan, Bolat, & Coşkun who studied the digital divide within and between member and candidate countries of European Union. They found that with greater levels of ICT use, a country also reflected greater levels of patent applications.

In an attempt to determine ways to bridge the divide, many authors began to build quantitative models in order to discover what variables have the greatest impact on whether an individual has access to online resources and whether he or she used those resources. The early models quickly found many similar factors, including age, level of education, socio-economic status, and race (Blau, 2002; Cooper, 2002; Cullen, 2003;

Vail, 2003; Fairlie, 2005). These factors all contributed to the digital divide. For example, typically as education levels increased, the use of the Internet also increased. As age increased, the use of the Internet decreased. Those with lower socio-economic status typically had lower access to the Internet.

Another factor that was discovered was the presence, or lack thereof, of a physical infrastructure. Many developed countries already had an extensive telephone service in place prior to the development of the Internet. This telephone infrastructure was used as the primary means by which data signals could be sent to other computers. However, this was not the case in most developing countries. These countries had little to no physical infrastructure in place, thus they had no physical method by which data could be sent. For example, "in Ethiopia, about 60% of telephones and 94% of the 6,000 internet accounts are concentrated in the capital, Addis Ababa. This is due to the limited telecom infrastructure, low levels of computerisation outside the capital and lack of human resources" (*ICT in Developing*, 2006). Infrastructure has become one of the primary variables used to calculate a score on most of the indices used to measure the divide (Dragulanescu, 2002; Rice & Katz, 2003).

As technology evolved and progressed, the discussion of infrastructure also began to evolve. With the advent of broadband, the discussion on infrastructure began to include the differences between those with broadband access and those with narrowband access. This further split among groups with access to online resources helped to illuminate the complexity of the divide and how challenging it is to begin to formulate any sort of approach to bridge it. This new variable of access speed has led to models with finer levels of granularity in studying variables that affect online access. Prieger and

Hu describe a model that would include variables such as "a database of ZIP + 4 codes and locations, a telecommunications wire center locations database, the FCC local telecommunications competition database, various sources for cable modem coverage, and the US Census Bureau for household demographic information (Prieger & Hu, 2008, p. 156). In addition, many authors are now calling for measures to track broadband speeds and broadband dissemination in order to make studying access easier for researchers, see, for example, Flamm, Friedlander, Horrigan, & Lehr, 2007, Prieger & Hu, 2008, Bouras, Giannaka, & Tsiatsos, 2009, and Oyana, 2011. These measures include "The type of internet experience the end-user has at the desktop depends on "last mile" infrastructure availability, users' awareness of it, and capacity to securely and skillfully take advantage of online connections" (Flamm, Friedlander, Horrigan, & Lehr, 2007, p. 3).

Some authors, such as Sawada, Cossette, Wellar, & Kurt and Grubesic & Murray, began using geographic information systems as methods to track this broadband deployment and look for areas that could benefit from broadband access more than other areas. This broadband access also included access to wireless technologies. This leap from wired connections into wireless connections often give regions with little physical wiring in place greater levels of access to online resources by circumventing the need for physical landlines. Areas that had once been too geographically distant from landlines are now being included in the information revolution with the assistance of these new wireless technologies (Campbell, 2001; Grubesic & Murray, 2002; Sawada, Cossette, Wellar, & Kurt, 2006).

This use of wireless technologies also led to an additional variable—the use of mobile phones—that has begun to have a significant impact in many developing countries (Dasgupta, Lall, & Wheeler, 2001). Mobile phones have greatly expanded the reach of online resources to many groups that might otherwise not be able to access them. Through the use of mobile phones and wireless technologies, many groups are able to pool their resources in order to purchase a smart phone and gain access to the online world regardless of their distance from a wired connection. Satellite phones have even further expanded the reach of online resources, allowing users to access resources from almost anywhere in the world. Some governments have even begun subsidies in order to make access to these satellite phones affordable for lower socio-economic groups (*The Satellite Phone*, 2012). This was done specifically in Australia in order to reach several of the lower socio-economic groups that were very distant from any urban centers (*The Satellite Phone*, 2012). This has also affected how infrastructure is now measured, moving from the traditional viewpoint of physical access and expanding the variable to include any type of access (Chen & Wellman, 2004; "The Real Digital," 2005). In the United States, a goal of the National Broadband Plan is to provide for mapping and further planning for methods to expand online access, especially to groups that have significant geographical barriers that limit physical access (Hudson, 2011). In the U.S., some limited programs along these lines have begun with great success, allowing the hurdle of geographic limitations to be overcome and allowing groups that are physically distant from centers of power to be able to still have their voices heard. Rowe describes how "in Montana, for example, rural carriers have deployed DSL in roughly 150

communities, including deployments on American Indian reservations" (Rowe, 2003, p. 89).

Another variable that is often reviewed is the methodology by which a country is addressing digital divide issues. Many authors find that while developed countries work on a spectrum of levels of access, developing countries run into walls with significant barriers to entry in order to make significant gains in access. These barriers to entry are often based on significant financial costs that are associated with gaining access to the Internet and gaining access to the current information and research, which are often locked behind subscription-based services (Foulger, 2001). The implementation of a wired network is often the basis for researching how a country is trying to bridge the divide. Some authors suggest following a route similar to that taken when the NSFNet was introduced in developed countries. By following a similar route for dispersing the connectivity, the developing countries could achieve access much quicker and easier than if an entirely new plan was designed (Press, 2004).

Another important variable that is studied is that of information literacy, which is defined as "the set of skills needed to find, retrieve, analyze, and use information" ("What Is Information," n.d.). Without this skill set, users can find themselves inundated with personal opinion and rumors presented as fact with no way of knowing which resources have been vetted and which resources are hearsay. Technology itself is not necessarily valuable, but what that technology gives users access to is valuable. However, if a person does not see the value of that access, then it will go unused. The knowledge is what is truly important, but the focus on access has often clouded that factor (Gebremichael & Jackson, 2006).

Government intervention in digital divide issues is also a variable that was included by many researchers (Mathur & Ambani, 2005; Jaeger & Bertot, 2009; Helbig, Gil-García, & Ferro, 2009 ; Hirwade, 2010). Some governments have used very directed resources in order to help bridge the divide. In the case of the U.S., the federal government offers a subsidy for libraries and schools in order to help them gain broadband access and make that access available to their communities. "To address the critical need for Wi-Fi networks in schools and libraries, the Order sets a target of providing $1 billion in annual support for internal connections" ("Funding for Broadband," 2014). As discussed earlier, the Australian government recently implemented a program to subsidize satellite phones for groups that live in extremely remote areas. However, not all governments are able or willing to do so. "Government monopolies of telecommunications systems and broadcasting networks in some Sub-Saharan nations limit the possibility of outside investment by restricting ICT sustainability in the private sector" (Gebremichael & Jackson, 2006, p. 272). This control over such resources exacerbates the divide and puts many countries even further behind in terms of access.

Some researchers have gone even further afield in terms of variables that could affect the divide. These include such variables as language, psychological factors, and cultural identity (Worcman, 2002; Kebede, 2004; Fairlie, 2004). This expanse of variables represents some of the richer fields of study in terms of variables that affect the digital divide. The core variables of race, education, socio-economic status, and age have been pored over in exhaustive detail by numerous researchers such as Cooper, Cullen, Press, Dragulanescu, Gebremichael and Jackson, and Blau. The divide continues to

present a problem and the gap between those with access and those without continues to grow. More specific variables need to be researched in order to present a wider field of effects. These variables include items such as specific skill sets, benefits of broadband, and proximity to wireless hubs as well as the effect of levels of democracy. By discovering which variables carry the greatest weight on access, policy makers can begin to build specific policies at the national, regional, and local levels in order to help bridge the divide.

Skill Sets

E-Government and the Digital Divide

An important theme that was prevalent in digital divide literature was that on e-government, defined as:

> the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government.... The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions. (*Definition of E-Government*, n.d.)

A number of authors agree that e-government has a number of benefits both nationally and internationally (Fang, 2002; Snellen, 2002; Chadwick & May, 2003; Helbig, Gil-García, & Ferro, 2009). These benefits range from increased transparency to a decrease in corruption. Services are able to be presented and made available to a much larger geographic area with little to no time lag involved. People no longer have to physically go to a specific office during specific times of the day and week in order to get work done with the government. Applications, waivers, and payments could all be

submitted to the government regardless of the time of day or where the user might be located.

In addition to allowing greater flexibility in terms of access to governmental resources, the transition from paper resources to digital resources is also seen as a cost-saving measure. Currently, most documents begin in a digital format and are then printed out for dissemination. Since these documents are already in a standard digital format, it was the next logical step to post these digital resources onto governmental websites for easier access. As these digital documents began to grow in popularity and use, many agencies began to reduce the amount of printed resources available, with some going so far as to only provide digital copies with no physical copies available (Singer, 2004).

While this benefits the government in terms of cost savings, it has had a detrimental effect on those groups with little to no access to online resources. For lower socio-economic groups, this has presented them with a large barrier in order to be able to access the materials that they typically need the most. As Kuk stated, "From the inception of e-government, the aim of encouraging disadvantaged groups (those with low incomes, the elderly, and individuals with disabilities) to take up the online services is more rhetoric than a reality" (Kuk, 2002, p. 361). In the event of natural disasters, such as hurricanes or floods, when there is a longer-term loss of power, large groups of people are often cut off from many governmental agencies that have moved to a completely digital format (Kuk, 2002; Bertot, Jaeger, Langa, & McClure, 2006).

A number of authors describe the benefits of e-government and how libraries can step into this void being left by many of these agencies in terms of access. Libraries can then use that role as provider to teach many of the skills needed to become adept users of

online resources. These skills include basic computer literacy skills and information literacy. Libraries can also begin to address the divide within their specific community, using more targeted programs in order to reach out to those groups that have been left out of this new information society (Mutula, 2005; Jaeger, 2003; Jaeger & Thompson, 2003; Cordella, 2007).

In addition, e-government has been shown to help increase the effects of democracy within a country. One way it does so is by alleviating geographic factors in countries with a widespread population or significant geographic obstacles, such as mountains or deserts or large physical distances that separate some regions from the seats of government. In Australia, "a technology gap of major proportions has long existed between remote Indigenous and other Australian's, continuing well into the Twenty First Century. The numbers around this were so stark that they approximated the contrasts seen between Third World and developed nations at the turn of the last century" (Taylor, 2012, p. 61). People can follow the actions of their representatives and make sure that their representatives are being the voice for their constituents (Rose 2004; Jaeger, 2005).

E-government is gaining fast adoption around the world. Even in non-democratic countries, e-government services are being offered in order to reach more groups of people by using cheaper resources. However, e-government does allow a more direct path for citizens to be able to communicate with their government (Åström, Karlsson, Linde, & Pirannejad, 2012).

In addition, e-government is seen as a portal by which the government can reach out to groups in order to address the digital divide. In many countries, while there is an official language, there may be multiple official languages or multiple languages spoken

by groups that are not considered the official language. Oftentimes, the governmental websites are only published in the official language or even in English, regardless of whether English is an official language of that country. Governments can modify all of their websites in order to capture more linguistic groups in order to make these resources more available to those linguistic groups (Hirwade, 2010, Bertot, Jaeger, Wahl, & Sigler, 2011). For example, the website for the Ontario Ministry of Labour in Canada offers resources by language which includes not only English, but Chinese, Dari, Urdu, Vietnamese and many others (*Other Languages*, n.d.).

Governments also use e-government websites as lines of communication between other governments, both nationally and internationally. In terms of certain intergovernmental entities, such as the European Union or the African Union, e-government websites can be used to discuss with other members the various projects of each member and ways that other member nations could participate and benefit from these projects (Chadwick & May, 2003). "The ADEN project ("supporting digital disenclavement") was set up by the French Ministry of Foreign Affairs to help improve access to digital communications in certain African countries… In Burkina Faso, it was established in collaboration with the government" (*E-governance and Citizen*, 2011).

E-government websites could also be used to facilitate the development of a national information policy. By reviewing how people gain access to those sites, what that access is used for, and the methods by which these services are found, agencies can begin to discuss national information policy changes that could have a much broader beneficial impact on the people they are trying to reach. Many times, the actual stakeholders in the divide conversations are the very people who are left out in terms of

consideration for their wants and needs. For some developing countries, Internet access may not be the top priority and individual access may not be the best fit at this point to have the biggest impact to bridge the divide (Wade, 2002; Bertot, 2003; Choemprayong, 2006; Yu, 2006).

In the U.S., many government agencies, such as the Federal Emergency Management Agency (FEMA), have adopted this digital provider role and have begun to reach out to libraries to assist in bridging the divide and making their documents more readily accessible to those without home access. In addition, feedback from users allows agencies to make adjustments based upon the access speeds that are being used to access their materials. If the majority of their materials are being downloaded via narrowband access, it is to their benefit to make sure their materials are as compact as possible, keeping graphics and charts to the bare essentials in order to make it quicker and easier for people to download (Jaeger & Bertot, 2009).

Libraries and the Digital Divide

In the field of Library and Information Science (LIS), it was not surprising to discover that much of the literature about the digital divide also included research on libraries. In the U.S., this was also a theme that was expected to be apparent, given that libraries are one of the cornerstones of national policy, such that it is, in terms of addressing the digital divide. In addition, in terms of e-government, many agencies are now incorporating library access into their information policies (Bertot, Jaeger, Langa, & McClure, 2006).

Several authors write on the digital divide with an appeal to librarians to take a proactive role in combating the digital divide. In many communities, librarians are often

ideally placed in order to reach out to their community and teach them how to utilize the resources readily available to them by using online access available through the library (Aqili & Moghaddam, 2008). In addition, some authors, such as Hargittai, Stern, and Ferro, Helbig, and Gil-Garcia, frequently chastised librarians for not doing enough to teach rudimentary computer skills to their communities. Oftentimes, most librarians are given significant training in terms of computer use and access. This is easily translatable into programs for the community in order to learn basic computer and information literacy. Simply providing computers is no longer a sufficient answer to combat the digital divide. In addition, libraries have the ability to build significant social capital with their community and allow them to offer specific examples of the return on investment (ROI) into the library (Kargbo, 2002; Bourke, 2005; Omekwu, 2006; Yamazaki, 2006). As Wilhelm stated,

> Libraries and museums have a central role to play in ensuring that all Americans are able to access and use effectively emerging communications tools, such as the Internet. These institutions are key pillars of the public sphere of communications, the realm of civil society independent of government and commercial forces that provides citizens the tools to become full participants in republican self-government (Wilhelm, 2001, p. 1).

A number of articles were written based upon the perspective of the librarians and what the digital divide looked like to them. Many librarians struggled with trying to come terms with the low level of technology skills possessed by the members of their community in a world where technology is an integral part of most lives (Wilhelm, 2001; Callison, 2004; Moe, 2004).

Libraries are often the only place where many patrons are able to gain access to the newest technology (Wilhelm, 2001; Hayden, 2003; Umbach, 2004; Kinney, 2010). For many patrons of the library that are well past school age, the library also represents one of the only venues for learning how to use computers, including even basics skills. Omekwu (2006) describes how the skills of librarians can easily translate into information technology (IT) skills that can be used to assist patrons in finding online resources quickly and efficiently. He stated that "librarians can help network users build and maintain personal information systems, which provide access to the subset of networked information sources relevant to each user's work" as well as "to identify and where appropriate, archive authoritative versions of electronic information" (Omekwu, 2006, p. 852).

Technology has fundamentally changed how many people communicate as well as how many people learn. These technological changes, however, have not reached everyone, causing a discrepancy and further separation between those groups that use this technology and those that do not. The Internet allows a user to participate in his or her community locally, nationally, and internationally and that those without access to this global perspective will be much more limited in their ability to find and analyze information.

In general, several studies found a correlation between income and public library computer use. As income levels increased, the use of the Internet moved from solely a form of entertainment and more towards a tool used for finance or learning (Howard, Rainie, & Jones, 2001; Moe, 2004).

Almost four out of five children access the Internet from home out of those who access the Internet. For many disadvantaged groups, the only point of access available to them for Internet usage is in school or at the library (Callison, 2004). This presents the librarians with a captive audience to build programs around that include information literacy and computing skills.

Many authors take the approach of how librarians can be active participants in addressing digital divide issues and how ICTs can be used to strengthen communities and provide a means by which to overcome socio-economic disadvantages (Aqili & Moghaddam, 2008).

Librarians are often the primary agency that sees how the issue of equitable access looks on a daily basis and the impact that access can have on an individual and a community. Libraries are well positioned in order to help achieve that level of equitable access, but they must be proactive in trying to make that a reality (Berry, 2002; Hayden, 2003). The library should be an integral part of its local community and should therefore have a better understanding of the needs of its community in terms of access. This integration is necessary in order to build the bridge across the divide within a specific area and community (Umbach, 2004). In addition, while local libraries are often well positioned to help address digital divide concerns, Lor (2003) stated that national libraries can play an integral function in addressing digital divide concerns. By assisting local libraries while also being national advocates for digital divide concerns, national libraries are well positioned to use their status and social capital in order to spread awareness of the digital divide and the detrimental impact that it has at the local, state, and national levels (Lor, 2003).

One important discussion that was frequently addressed by several authors was the fact that, while many libraries were the primary means to combat the digital divide within their community, they often were not given enough resources to do a comprehensive job due to shortages in finances, manpower, and/or technology access (Bertot, McClure, & Jaeger, 2005; Mandel, Bishop, McClure, Bertot, & Jaeger, 2010). In addition, as the recession deepened in 2009 and unemployment rose, libraries began to be inundated with patrons in need of electronic access to resources while, at the same time, struggling with shrinking budgets that often put the library in an even greater shortage of finances, manpower, and/or technology access. Libraries were caught up in a perfect storm of ever-decreasing funding sources while struggling to cope with ever-increasing numbers of patrons in desperate need of online access (Becker et al., 2010). Becker et al find that "although demand for library computers is high and continues to grow, since 2001 the number of librarians available to assist patrons has not grown at the same pace as the rapid increase in visits, circulation, and availability of public access computers. Further, the number of hours libraries are open has remained flat or in some years fallen. Supporting these observations further, the latest Public Library and Internet Study for the American Library Association (Clark et al., 2009, p. 8), shows that 81 percent of libraries cite insufficient availability of workstations, time limitations are being placed on the use of work stations, and that 63 percent of libraries rely on nonprofessional IT staff or library directors to carry out technical support" (Becker et al., 2010, p. 17).

Several articles also research the return on investment of libraries, with particular notice given to electronic access and digital divide issues. Internet access has become one of the greatest draws for many patrons, especially those who do not have access at home.

By giving unfettered access to online resources at significant speeds, typically using broadband access, libraries are able to give opportunities to the community that might otherwise be lost. Many corporations only accept online applications for jobs. By allowing patrons access to the Internet, libraries are often able to increase the economic situation of patrons who might otherwise be locked out of employment opportunities. "In the study, 40 percent of the respondents (30 million people) used library computers and internet access for employment or career purposes. Among the employment users, 76 percent used a library's computers or Internet connection specifically for their search for job opportunities" (Becker et al., 2010, p. 6). However, many funding agencies prefer to see quantifiable returns on the investments made. By quantifying the return on the investment made to libraries, Bertot et al. hope to present tools to libraries that will assist them in requesting the additional funding needed to expand their online presence and activities. He, along with several co-authors, expound upon the importance of libraries in the battle to bridge the digital divide and present libraries as the forerunners in allowing access to socio-economic groups that would otherwise be completely left out of this information society (Bertot, Jaeger, Wahl, & Sigler, 2011; Jaeger, Bertot, Kodama, Katz, & DeCoster, 2011). Examples include amount of use of licensed databases, number of participants in IT training, number of job recipients that specifically used library resources, and number of users that were assisted with using government Web resources, applied for government services or were assisted with completing government forms (Bertot, Jaeger, Wahl, & Sigler, 2011, p. 11).

Education

Education, while at first glance may not appear to fit well in the skills category, is actually one of the prevalent themes in much of the literature. This is due, in part, to the fact that education is often seen as one of the primary methods that will be effective in bridging the divide. By educating people in effective use of online resources, as well as teaching them how to evaluate the materials presented online, many disadvantaged socio-economic groups will have a path available to use online resources and use them well (Brooks, Donovan, & Rumble, 2005).

Many schools in lower socio-economic neighborhoods are often the very schools that have the least amount of access to online resources. This lack of access is a huge disadvantage as schools are typically one of only two primary access points that many lower socio-economic groups use to gain access to the Internet (Thicksten, 2003). In addition, this lack of access sets a routine in terms of locating information and resources that often follow students throughout their academic career. This typically leads to a gap between the students entering college who have had access to technology and online resources and those who did not have similar access (Eamon, 2004).

Students who are familiar with online resources and technology are significantly more likely to begin doing research and studying using online materials and resources than are their peers who are not as familiar with the materials and technologies available online (Levin & Arafeh, 2002). Many college courses make general assumptions about the students' ability to locate and use online resources. However, some earlier research indicates that as much as 49% of college students did not begin using the Internet until they arrived at college (Jones, 2002). Unfortunately, the remainder of students who did

grow up with online access readily available often do not realize that their peers are at such a significant disadvantage. One study discovered that many students entering college often feel that the Internet is as common as television channels and that all people have easy and equal access to it (King, 2002). In 1999, "roughly 94% of American households with telephone, 37% with PC, 26% with modem, 19% with internet access - may not raise immediate alarms, a different presentation of the same numbers - 6% without telephone, 63% without PC, 74% without modem, 81% without internet" (King, 2002, p. 67).

Millennials are defined as "a person born in the 1980s or 1990s, especially in the U.S.; a member of Generation Y" (*Millennial*, n.d.). This generation is one where access to the Internet was always available as they grew up. Unfortunately, many observers assume that most Millennials are very technology savvy. However, this assumption concerning Millennials often put those groups that did not have access at an even further disadvantage, as little to no formal training is available at the college level (Stoerger, 2009).

Research has shown that this discrepancy between assumed skill sets and actual skill sets has a detrimental effect on academic performance, especially by those students who have had no access to online resource prior to entering secondary education (Huang & Russell, 2006). Huang and Russell state that in their research, they found that the school "that has the highest technology accessibility for its students both at school and at home ranks the first in all test subjects"(Huang & Russell, 2006, p. 167). In addition, while computers may be available, often little to no classroom time is set aside specifically to teach students how to use the computers or the online resources that makes

the Internet such a powerful tool. “For instance, although most classrooms have computers with internet connection, 12 percent of the teacher responses say that they are not available for student use on a daily basis. 84 percent of the teachers reported that classroom computers were used less than one hour per day by students” (Huang & Russell, 2006, p. 167).

Research has shown, however, that the school media center can be used as a positive tool to teach students how to effectively use technology and online resources and methods to evaluate the materials they find online to determine whether they are appropriate. School media personnel are often well trained via their degrees in the use of IT and can translate those skills into teachable units to bring their students up to speed on the newest technologies and resources that are available (Omekwu, 2006; Franklin & Stephens, 2009).

Technology has changed education and provided a medium that can address a variety of learning styles. It has also changed how society views literacy:

> The new literacy, beyond text and image, is one of information navigation. The real literacy of tomorrow entails the ability to be your own personal reference librarian-to know how to navigate through confusing, complex information spaces and feel comfortable doing so (Brown, 2002).

This new form of literacy, though, is only useful to those groups with access to technology and who possess the skills needed to efficient and effectively use that access.

Some researchers tackle these ideas by looking at the way teachers are addressing technology in the classroom. While teachers often discuss ways to learn with technology, it is also imperative that they teach about the technology as well. While the Internet is a

prodigious source for information, it is also a massive source of misinformation. Students who have little to no skills in evaluating the information being presented online may erroneously accept opinions or even propaganda as facts because they found the information online (Gillan, 2003; Doyle, 2006). Many instructors take the approach that the technology can act as a replacement teacher, whereas the reality is that students need guidance and supervision in order to be successful at learning through the use of technology (Gillan, 2003).

Even prior to the acknowledgment of the digital divide, Martinez (1994) discussed the benefits of increased technology in the classroom to students. He stated that technology can be used as method to provide greater levels of equality to all in terms of materials that are available in the classroom or as another means to polarize socio-economic groups between those with access and those without access to those materials (Martinez, 1994). This leads to another aspect of the digital divide that was studied by several researchers; the divide between the teachers' knowledge of technology and their students' knowledge. Unfortunately, many primary school teachers are often not as knowledgeable about the use of technology and view it as a disruption to their teaching curriculum (Gillan, 2003). This often leads them to dismiss the use of technology in the classroom or the use of technology only in very limited amounts.

The developing world is taking this issue to heart as they begin to see themselves falling further behind in terms of development. The internet and the resources available can provide excellent teaching tools to anyone that gain access to them. Many developing countries are taking advantage of these resources by providing as much technology access as possible in the classroom and at as early of an age as possible. "Many teachers

in developing countries are trained through distance education projects" using technology (Tiene, 2004, p. 94). This also includes allowing the teachers to buy into the adoption and integration of technology into their classrooms. "The most dynamic applications of ICT are those facilitated by a teacher who is prepared to take full advantage of its potential" (Tiene, 2004, p. 92).

Current research shows that pedagogy that includes technology has a significantly beneficial effect on students who are preparing for secondary education. Teachers must be up to date on their content areas and on the pedagogical methods that best relay that content. "Such knowledge includes how to use various software packages, peripheral devices, and Web sites, expanding, then, to effectively selecting those resources that would most powerfully support the learning goals of the classroom" (Banister & Reinhart, 2011, p. 9).

Skills

The final theme that emerged in the literature in the category of skill sets was that of skills themselves. Oftentimes, in an attempt to help, organizations will introduce new technologies to help groups better themselves. Unfortunately, the groups that would benefit the most from the use of this technology are often the ones with the least amount of skills available to make use of the technologies. Research has shown that when a group does not possess the skills needed to use technologies effectively or efficiently, group members do not use the technology, relying instead on methods with which they are familiar (Grabill, 2003; Hargittai, 2002; Hargittai, 2010; Stern, 2010).

Many groups' reticence is affected by an actual lack of skills and their perceived lack of skills. Many groups are often intimidated by technology, given their lack of

formal training or experience with technology previously. While the skills they possess might often translate well into a digital environment, such as skill with typewriting, translating directly into successful use of a keyboard, the new environment often causes significant confusion and allows the user to make the decision not to use the technology. "The Internet requires development of a further set of skills that, to the novice user, at least, may be daunting. These include establishing and maintaining a stable Internet connection, learning how to navigate on the Internet, and searching it for relevant information" (Eastin & LaRose, 2000). While education is often the key to changing this attitude, the groups are often still behind in terms of adoption of new technologies due to this perceived barrier to use (Eastin & LaRose, 2000).

Some research discovered that on a day-to-day basis, the lack of technology skills has a detrimental effect. For example, any groups, while interested in technology, have no background by which to even begin learning how to make use of the technology that may be available to them. People may often pass over opportunities, such as the chance at a new job, due to the fact that a significant amount of it involves the use of technology, often including the application process itself (Dewan, Ganley, & Kraemer, 2005). In addition, some groups see no incentive to make use of new technologies or resources. Their current skill set is sufficient in order to maintain the status quo of their lives and they see no reason to expend the resources need in order to learn new skills (Ferro, Helbig, & Gil-Garcia, 2011, p. 8).

Some groups are so marginalized, such as the homeless, that they possess little to no skills that might translate into use with technology. This keeps them at a further disadvantage in terms of socio-economic growth due to the growing adoption of digital

access even to job boards. An issue that many homeless in the U.S. must contend with is "whether they were able to determine which information sources could provide information that led to the gaining or maintaining of needed resources" (Hersberger, 2002, p. 55).

An added benefit of the introduction of technology is that productivity and efficiency have been shown to improve as a greater level of technology literacy is introduced (Goss & Phillips, 2002). Wages increase as greater levels of technology skills are present in the workforce and greater levels of production have been shown to be achieved. For example, "employees who used a computer at work earned 10 to 15 percent more than workers who did not" (Goss & Phillips, 2002, p. 464). This presents a path for lesser developed countries to better their productivity and improve conditions for many of their citizens as well as be able to increase services based upon increased tax revenues from these higher wages. By pushing for greater levels of education on technology skills, lower socio-economic groups have the opportunity to better themselves and their communities by gaining better jobs and increasing their wages (Chabran, 2000) For example, "using data from the French labor market each year of computer-based experience increased wages by approximately 1 percent…, even after controlling for this selectivity bias, the authors estimated that on average, those who use technology earned a wage premium of approximately 16 percent (Goss & Phillips, 2002, p. 465).

In some areas of the world, this lack of technology skills presents a significant barrier to be able to spread new technology skills. With little to no formal training available, many sub-Saharan countries are not even keeping up with the growth rate of the rest of the world, much less making any gains to bridge the divide (Oyelaran-

Oyeyinka & Lal, 2005). "Current estimates show that Internet use in Africa lags behind that of other regions. Regional distribution of the Internet users… shows that in the first quarter of 2002 worldwide users of the Internet reached 580.78 million with only 6.31 million in Africa, only about 1% of world total" (Oyelaran-Oyeyinka & Lal, 2005, p. 508). While the lack of infrastructure and human capital are also persistent issues, the lack of skills was the biggest concern. Without the necessary skills to even maintain a network, the introduction of a complex infrastructure would not alleviate many of the divide problems that were rampant in many sub-Saharan countries.

One of the strengths of the Internet is that it not only stores information and allows others to access it. It also allows people to generate their own knowledge, building on materials already present and increasing the store of knowledge within a society. For groups and countries, such as sub-Saharan Africa, that do not have access to the information readily available on the Internet, they are not able to make these leaps in knowledge as they are not exposed to the information necessary to help in that process (Oyelaran-Oyeyinka & Lal, 2005). Students are able to stand on the shoulders of those researchers and instructors who have gone before them and reach new heights of discovery. The Internet greatly enhances this process as much of this information is readily available through databases and data sets. Therefore, instead of starting from scratch, other researchers are able to analyze the findings made by previous researchers and learn from their successes and failures. This allows for a huge savings in time and resources as researchers are able to see what others had already discovered and use those successes as a starting point to begin new lines of inquiry. However, many of these

resources are not readily apparent to new users, thus denying them the ability for this jump start in their research (Ojala, 2002).

Another point of concern among many of the articles is the lack of literacy skills needed to make the most efficient use of the materials available online. While the Internet possesses a tremendous amount of information, not all of this information is vetted for accuracy or balanced against bias. This allows for the introduction of erroneous assumptions into research that could otherwise greatly benefit a country or institution (Debono, 2002; Mitchell, 2002; Kornblum, 2005; Fourie & Bothma, 2006).

Many authors, for example, Cullen, James, and Peter & Valkenburg, have found that by teaching information literacy skills, patrons are more confident in their use of technology and more likely to begin to experiment in using technology that they previously would not have used. While there have been many studies looking at various variables that have an impact on the divide, teaching skills to each of those groups was a universal method to help bridge the divide. While some personalization was recommended, oftentimes, programs were open to all ages, allowing for some more advanced users to assist novices (Cullen, 2003; Peter & Valkenburg, 2006).

As technology continues to grow, many socio-economic groups are unable to keep up with the newest innovations in hardware or software. Therefore, the skills they possess may quickly become outdated. A user who is skilled in the use of Windows 3.1 may not be able to translate those skills easily into the use of Windows 8. Students who are able to learn technology skills while in primary school are better positioned to continue with the use of technology. “Most people will have technologies at their fingertips not only to communicate but to create, to manipulate, to design, to self-

actualize. Children learn these skills as part of their lives, like language, which they learn without realizing they are learning it" (Jones-Kavalier & Flannigan, 2006, p.8).

Infrastructure

Open-Source Software

The decision to include open-source software in the literature was twofold. One primary reason was the fact that open-source software is often touted as one method to bridge the divide (Herb, 2010). Another reason is that open-source software is another form of access to technology that is greatly beneficial to lower socio-economic groups.

One of the main premises of open-source software is that allows for much greater levels of access to all groups. To be officially defined as open source, one of the criteria is that the software be open to all groups, regardless of race, ethnicity, or any other form of discriminatory labeling. This allows any group to freely download and use the software.

Open source also removes a significant barrier to entry in gaining access to online resources. Programs such as Open Office allow users to open and modify a large number of proprietary formats, such as those found in Microsoft Office products, without being forced to purchase expensive software. In addition, many web browsers are open source, allowing for greater flexibility in terms of use and access (James, 2003).

In developed countries, libraries are often able to adopt a large number of open-source programs, as many librarians are already familiar with many of the IT skills necessary to use the programs. With ever-shrinking budgets, open-source programs present a cost-savings opportunity for libraries while also allowing them to introduce the software to groups that might be unable to purchase the corresponding proprietary

software packages. This presents an opportunity of synergy between the needs of the library and the community it serves. It also presents developing countries the opportunity to use software with fewer constraints than the proprietary software packages. It also gives them the opportunity to develop their own solutions to problems that may be specific to their particular application (Usova, 2009).

A number of authors discuss using open-source software to develop open-access journal databases. Another significant barrier to entry to access many online databases is that most professional journals are only available through prohibitively expensive subscriptions. In 2013, the average price per journal for a Chemistry journal was ~$4450, with Physics close behind with an average price of ~$3893 per journal (Bosch & Henderson, 2013). Many developing countries are unable to justify the costs necessary to gain access to these journals. By building open-access databases, many countries would be able to begin to gain access to vast repositories of knowledge and information that is often taken for granted by more developed countries (Björk, 2004; Law, 2004; Haider, 2007).

Internet and Communication Technologies (ICT)

ICTs are one of the cornerstones in terms of infrastructure needed to fully access the Internet. ICTs provide a direct economic benefit, as research has shown that ICTs generate a significant number of well-paying jobs (Antonelli, 2003). Gross domestic product (GDP) has been linked directly to growth or stagnation in the ICT sector. The greater the growth in ICTs, GDP has a correspondingly greater rate of growth. This is trend is not a short-term gain, but it holds true over long-term GDP growth as well (Norris, 2000).

This growth is not only economic success at the national level, as it also impacts the economy at the state and local levels. ICTs can bring much-needed economic and educational opportunities to communities that desperately need them. For ICTs to grow, investments in human capital must be made, thus increasing the level of education in an area as a direct result of the introduction of the ICT. ICTs can help to strengthen a community as they often become a community-wide project to gain the skills necessary to support and maintain the ICTs (McLaren & Zappalà, 2002).

In terms of ICT growth, there is a significant divide even among developed countries. Europe is quite diverse in the levels of access to ICTs in terms of national differences and state levels within a country. There are also significant differences between Europe and the U.S. in terms of access and availability. Scandinavian countries have made marked strides in providing access to anyone who wants it. This access is prescribed even further by legislation that contains specific lower limits on access speeds. In Finland, anyone in the country who wants access is guaranteed access to broadband via subsidies between the government and the ICT companies (Sicherl, 2000).

Research has shown that ICTs have greater economic benefits than is apparent by calculating the return on investment that was put into the ICTs. Angelou and Economides (2009) discuss how similar methods for investments using game theory and real options theory, as opposed to return on investment, can be applied to the investment into ICTs and give a much better estimate on the long-term benefits of that investment.

In addition, several authors, such as Opesade, Raju, and Kiiru and Mburu, discuss how ICT investments can be designed to bridge the digital divide. Opesade (2011) discusses how digital divide issues in specific geographic areas should be included as part

of the overall discussion on ICT investment. Lower socio-economic communities, such as those in rural areas or developing countries, should be given greater priority as investments are made, as these communities will gain the greatest benefit from the investment. By introducing greater levels of education and skills into the community, people will begin to gain access to the tools they need in order to get better jobs and increase their quality of life.

This investment in rural areas will also benefit the communities by providing a direct route for communications. Current news and events could quickly and easily be sent to towns and villages using the newly introduced ICTs (Raju, 2004). Farmers would have up-to-the-minute prices available for their crops, allowing for greater equity in pricing. In rural Africa, ICTs are used by farmers and distribution centers to quickly weigh and process their goods, calculate the wages for the farmers, and to send payment to the farmers in a timely fashion. This process dramatically decreases the amount of time it takes for farmers to get paid for the products, freeing up significant amounts of their capital that they can reinvest. Microfinance transactions are also becoming possible through the introduction of ICTs into rural areas. These are small, short loans that are typically not worthwhile for banks to process or handle. With ICTs, farmers and small business owners are able to take out short-term loans for small amounts to get them through times where they are between processing and selling their products. These small loans help them to keep their heads above water financially while they conclude the sale of their products. ”43% of the poor will take the loans with a major objective of first meeting the basic needs, mostly providing food for the family with an intention of investing the remaining money” (Kiiru & Mburu, n.d.).

One point of concern about ICT investment and growth is that oftentimes the same strategy is applied universally without looking at national or local conditions. While this may work in some areas, in other areas, these strategies do not work, wasting much of the investment and giving little to no return from that investment. In many African countries, ICT access looks and works much differently than it does in Europe or the U.S. When making investments in ICT infrastructure, often the same strategies for introducing the ICTs are used. However, a viable access strategy be only developed by looking at the specific community and area. This would give a significantly greater return on the ICT investment as well as bring greater benefits to the community. For example, "Africa's first NEPAD e-school was launched in Uganda in July 2005. The project included equipping the school with computers and accessories, a server, the internet, electricity, a mobile telephone booster mast, computer desks, DSTV, an e-health facility, and trained teachers" (Mutula, 2008, p. 478). This school was built specifically with the needs of Uganda in mind and programs in place to address the specific needs of the community.

While many researchers agree that ICTs increase economic opportunities (Norris 2000; Antonelli, 2003; Meso, Datta, & Mbarika, 2006), there is also a cost associated with ICT growth. Some research has shown that ICTs exacerbate social exclusions problems, such as marginalization and lack of access to public services. This, however, is not a symptom of the introduction of ICTs but a symptom of the inequality of ICT distribution. Often, ICTs are introduced into urban, more affluent areas first. These areas typically have a higher socio-economic status than their rural counterparts. Also, the groups that are already marginalized are typically the same groups that cannot afford to pay for the access that the ICTs introduce. These factors amplify already existing social

problems. As Warren stated, “those with high levels will gain more than people with lower initial levels (Warren, 2007, p. 378). In addition the productivity paradox between increased technology use still persists. With greater levels of technology adoption, there is typically not a correspondingly increased level of productivity.

Many databases have begun to move to single providers. This gives the providers a monopoly on the information available in those databases. This also gives the providers the ability to set prices anywhere on the spectrum that they choose. This can present an overwhelming barrier to entry for lesser developed countries (Bell, 2001; Brooks, Donovan, & Rumble, 2005). Given the increased costs that many lesser developed countries pay in relation to the developed countries, the additional cost of access to these databases is often more than they can fit into their budget. As Bell stated, “Whatever these libraries hope to save in the short run may be lost in the long run, as publishers and aggregators combine to break this model with higher database licensing fees and embargoes in their efforts to recoup lost revenue” (Bell, 2001).

Human Capital

Human capital is defined as “the collective skills, knowledge, or other intangible assets of individuals that can be used to create economic value for the individuals, their employers, or their community” (*Human Capital*, n.d.). Human capital is also one of the factors included in measuring the digital divide within a country.

In order for a community to make the most efficient and effective use of an ICT, they will need to have the education and skills necessary to do so. This includes such skills as literacy, mathematics, and some level of programming skills, as well as some grasp of the physical infrastructure itself.

Much research has been done on reviewing other human capital topics that affect the divide. Several themes became apparent as the literature was reviewed in terms of communities and their social capital. These themes include social inclusion, rural and urban users and ultimately people's lived experiences.

Social Inclusion

Social inclusion was an important theme found in the literature. ICTs have the potential to exacerbate many of the social issues prevalent in a society. One of these social concerns is that of social inclusion. Some research has found that the digital divide exacerbates social problems that have been in place for years (Agosto, 2005; Saleh, 2009).

Several researchers discussed how much of the research on the divide had been too narrow. Many of the solutions presented by earlier researchers had focused only on the technological aspect of the divide. By giving the most current technologies to communities, these communities should be able to join the information society and partake of all the benefits derived from it. However, this is not the case. Many groups do not have the skill sets needed to fully make use of those technologies. Many communities do not even have the basic literacy skills necessary to effectively use much of the technology (Bucy, 2000; Ono & Zavodny, 2007).

A number of researchers also discuss the idea of the information poor. These researchers include Chatman, Hersberger, and Britz. These are groups that have been marginalized by their community and thus lack many of the traditional forms of information access that others may have. One of the seminal works on the information poor was by Chatman (1996). Chatman researched how people deal with information, or

the lack thereof, within their own lived experiences. While at the time, this was not a discussion on the digital divide, her insight into the transfer of information is highly applicable to divide issues.

Several researchers, such as Britz, Hersberger, and Saleh, continued this idea of the information poor by using the digital divide as the backdrop. Their research of the information poor reviewed the effects that the digital divide has on their continued socio-economic status. With no access to the Internet, many were unable to fill out applications, much less find job postings that had no print equivalents. They were not able to do cost comparisons using company websites or look for alternatives for transportation other than what they already knew about (Britz, 2004; Powell, Bryne & Dailey, 2010). Finer granularity was applied in terms of access, such as using broadband access instead of narrowband access. This research found that those with broadband access were able to use more resources in less time, thus greatly increasing efficiency. Even this difference between levels of access magnifies the factors of exclusion. "Broadband networks will be as critical to the 21st Century as roads, canals and railroads were to the 19th Century and the Interstate Highway System and basic telephone networks were to the 20th Century" (Bouras, Giannaka, & Tsiatsos, 2009, p. 795).

This social exclusion was reviewed by Ferber, Foltz, & Pugliese (2008). Their review was done by analyzing the methods used by state legislature websites in presenting information. They found that many websites exhibited a form of exclusion based on language and style of the websites. This idea was approached by also reviewing digital inclusion and discussing whether digital inclusion is also equivalent to cultural inclusion (Worcman, 2002). "It is necessary to first make computers and their use

meaningful to the people who will be using the computers. Communities need to be engaged in the digitization of their own stories as a means of social affirmation" (Worcman, 2002).

One idea was that innovation is often diffused into a culture differently. Communities should be studied in order to understand how technology is adopted and diffused throughout the population. By determining which factors present the greatest appeal to a certain community, these factors could be used to help introduce more advanced technologies (Kaye & Little, 2000). One such factor is the language in which information is presented. Research found that a culture often identifies itself through language. However, in the current online environment, individual language is often lost, causing many communities to dismiss new technologies (Warschauer, 2000). The "Internet highlights the role of language while simultaneously masking the role of other identity markers such as race, gender, or class" (Warschauer, 2000).

Many communities are focused more on local concerns than national or international ones. However, for many rural communities, little to no information is readily available about their local concerns. This lack of local information often discourages rural communities and groups from engaging or participating in the online discussion (Lazarus & Mora, 2000). In addition to the lack of local content is the lack of use of a local language. The language used to present the information is often a barrier to entry for many non-English speakers. The vast majority of websites are written in English, even websites that focus on non-English speaking communities (Fairlie, 2004).

Social exclusion is a problem that afflicts a variety of socio-economic groups. Research found that social implications of the divide are spread across the spectrum of

users and often have a detrimental effect on the continued use of technologies (Kim, Lee, & Menon, 2009). Some research analyzed the differences between some of the groups that have access and those that do not, and some of the factors that influence the decision to gain access (van Dijk, 2006). This is seen not only in developing countries, such as Kenya, but in disenfranchised groups in developed countries, such as the homeless (Hersberger, 2002).

Research also found that digital exclusion is highly correlated to social exclusion for most groups. Therefore, for most marginalized groups, their exclusion socially will also include exclusion from the digital discussion as well (John, 2009). From a economic perspective, research found that the digital divide follows similar exclusive patterns as social justice and social exclusion (Duff, 2011).

Another concern that was examined was who, if anyone, benefitted from the digital divide. One point of concern was that ICT penetration was also being used as a new form of colonialism. By keeping certain groups from gaining access to information, such as current market prices, some countries and groups were able to gain access to cheap labor and materials. “Just as mercantile capitalism coveted the raw materials of Africa, Asia and Latin America; and industrial capitalism increasingly used it as a manufacturing platform; informational capitalism has plans of its own for the South as a market and a site for offshore informational processing“ (Luyt, 2004). This capitalistic policy was followed by external groups within a country as a way to work as intermediaries between their countries and the local populations. Thus, they were able to benefit both socially and economically by providing outside groups with cheap resources while internally providing a market for local community resources, although at

discounted prices. “In the case of India and the Philippines, data processing work is complemented by a focus on contact centres“ (Luyt, 2004).

Some researchers were concerned that those groups best poised to assist with bridging the divide were also the ones that helped to create the divide in the first place. By creating gaps in technologies, some companies were able to prolong the shelf life of older technologies by selling them to lower socio-economic groups. This kept these groups in the technology game but at a disadvantage by not having access to the newest, more efficient technologies that were available (Houston & Erdelez, 2004; Fuchs & Horak, 2008). As Houston and Erdelez state “perhaps they imply that the digital industry applies pressure on legislators to purchase and distribute machines that would be unmarketably slow by the time a government had evaluated, legislated, funded, and purchased the machines, eliminating at profit an embarrassing inventory of obsolete machines” (Houston & Erdelez, 2004, p. 28).

Just because a group is not included in the digital discussion does not mean they are not producers of information. “I use *zones of silence*, to mean the unseen, seemingly quiet, technology–sparse spaces of the digital divide. Mansell and Wehn (1998), writing about developing countries and the international governance system, use the phrase to mean the places, found in the developing world, where communities are effectively “silent” because of a lack of access to ICTs.” (Potter, 2006). However, this assumption is erroneous (Potter, 2006). These groups often produce as much as information and knowledge as other, more connected communities; they have no method by which to share that information other than more traditional methods, such as print or oral traditions.

While socio-economic groups are often the focus of social exclusion, much research has also been done on the "gray" digital divide. This research focuses less on socio-economic status and examines differences based on age (Morris & Brading, 2007). One example is the lack of instructions available on even basic computer use. With the advent of the Millennials, many groups assume that everyone possesses the rudimentary knowledge needed to use a computer. For many older adults, this is not the case, as they never received even basic training in the use of a computer. During their primary and secondary education, computers were only available to those in specific research fields. Their professions may not have included any computer use prior to their retirement, thus leaving them with little to no opportunity to interact with technology. As Fox stated, "Just 29% of Americans age 65 and older uses a computer on at least an occasional basis. Many of these Americans were probably not in the workforce when computers became standard issue at offices, schools, factories, and other work sites" (Fox, 2004, p. 11). "While many retirees are not connected, the generation soon to be in retirement is much more net savvy and more likely to adopt new technologies (Fox, 2001; 2004). "While today's senior citizens are the least likely to go online, the cohort behind them is among the most wired. Those aged 50-64 are likely to keep their Internet access even after they retire. An American between 50 and 64 years old is three times more likely to have Internet access than someone over the age of 65 "(Fox, 2001, p. 12). In contrast, for the current retirees, their level of access is often much more limited.

One point of concern is that this gray divide is increasing in terms of access to technology. Costs such as those associated with mobile phone use or broadband adoption are often well outside of the ability of many retirees to be able to afford (Paul &

Stegbauer, 2005). Research has found that even for those who possess the monetary means for access, psychological factors hinder many older adults, those 65 and older, from using newer technologies (Broos & Roe, 2006). "Those who under-estimate their competences will be more easily discouraged when something fails while those who believe more firmly in their self-efficacy will persist even when, at first, the expected result is not reached, i.e. they will tend to continue until they succeed" (Broos & Roe, 2006, p. 308).

Also, many older adults have only seen the Internet as a venue for entertainment. This experience is included as a factor that often causes many older adults to discount the usefulness of the Internet (Loges & Jung, 2001). "People older than 65 report much less agreement with some attitude- and goal-related questions regarding the Internet than do people younger than 30. Seniors are about half as likely as younger respondents to agree with such statements as 'The Internet would help me find things'" (Loges & Jung, 2001, p. 541). Given the amount of misinformation and noise often associated with the Internet, the message concerning the usefulness of the Internet is often lost. Many older adults only hear about the misuses of the Internet in terms of fraud or about the volume of adult material that is readily available online. They often miss the messages concerning the usefulness of the Internet, such as the ability to research drugs reactions or the ability to have greater control over investments using online trading companies.

Another group that was studied by some researchers was women. Studies analyzed examined the frequency and scope of Internet use by women to determine whether gender played a role in digital divide issues (Wasserman & Richmond-Abbott, 2005). Some inequality was found to be present between the levels of access women had

in comparison to their male counterparts. “Consistent with previous studies, it is found that women use the Internet less frequently than men” (Wasserman & Richmond-Abbott, 2005, p. 261). How the Internet was being used also differed between the two genders. “Men were more likely to use websites that provided financial information, government information, news and current events, and sexually explicit information. By contrast, women were significantly more likely to use religious and church sites, as well as cooking and recipe sites“ (Wasserman & Richmond-Abbott, 2005, p.263). This raised some questions as typically males used the Internet for more business applications.

Research was also done analyzing the long-term effects of this digital exclusion. One conclusion was that the ability to participate and prosper in the new economy may be permanently impaired if some long-term gains are not made to bridge the divide between those with access and those without (Cooper, 2002b). “If a household is cut off for a decade, its ability to participate and prosper in the new economy may be permanently impaired. If a group is not well represented as the architecture of the Internet becomes defined and the patterns of deployment established, the needs of the group may never be well represented in cyberspace” (Cooper, 2002b, p.3).

Rural vs. Urban Populations

There is a significant difference between the levels of access available to rural communities and their urban counterparts. Faster levels of access speeds are much more readily available in urban areas as is a greater selection of providers from which to choose. This lack of access in rural areas is often exacerbated by providers as they are able to charge more and provide less for the services offered in rural communities (Grubesic, 2003). “Many residents say they have just two options for Internet service.

They can choose between a satellite connection, which they say is more expensive and less reliable than wired Internet. If they can't afford satellite, they are stuck with dial-up, which most Americans replaced years ago with Internet speeds that are more than 20 times faster" (Smith, 2012).

This gap of access and services between rural and urban communities is in place and widening. ISPs are introducing faster services at better rates in urban areas due to increased competition. However, this increase in services and decrease in cost is not always passed on to the rural areas (LaRose, Gregg, Strover, Straubhaar & Carpenter, 2007). This gap between rural and urban areas is not just increasing but increasing rapidly. As LaRose et al state "only 24% of rural adults living outside of Metropolitan Statistical Areas (MSAs), compared to 39% of urban and suburban adults in MSAs had broadband Internet in their homes" (LaRose, Gregg, Strover, Straubhaar, & Carpenter, 2007, p. 360).

Due to the wider spread of rural populations, new technologies often diffuse into the population at a much slower rate than in urban areas. This exacerbates this gap between services, as even when services are available, it takes longer for these groups to begin to adopt their use and integrate them into their daily lives (Hollifield & Donnermeyer, 2003). "Adoption levels in rural areas have tended to lag those in urban areas, compounding the problem of demand aggregation. Studies of adoption patterns among rural residents showed rural adoption rates lagged even where access to the Internet was available and despite the widespread conviction among rural residents that these technologies were critical to their communities' and their own futures" (Hollifield & Donnermeyer, 2003, p. 136).

These conditions begin to bring adverse circumstances to rural areas, as they are not able to react to changes as quickly as their urban counterparts. As market prices fluctuate, those with access to this newest information are able to capitalize on it immediately. However, for groups that are not aware of changes in market conditions, they may agree to sell products or services at a much lower rate than what the market is currently offering. Sadly, this scenario happens frequently at the local, national, and international level. Rural areas have always lagged behind urban areas in terms of access and this trend continues and worsens as better products and services are introduced into urban markets (Kastsinas & Moeck, 2002). "Only 12.2% of rural Internet households had broadband connections in 2001, compared to 21.2% of urban, noncentral city Internet households and 22% of central city households.7 The use of slow-speed connections to the Internet makes it difficult, if not impossible, to use effectively information networks for business applications" (Hollifield & Donnermeyer, 2003, p. 136).

Some researchers actually voluntarily unplugged themselves and experienced life being completely distanced from most technologies, including in one case, still using a rotary phone. The vast discrepancy between those with access and those without were immediately apparent, both socially and financially (Cart, 2005; Cisler, 2005). Even such ordinary activities as placing an order through the phone became impossible with the use of a rotary phone. Many businesses assumed that everyone had some level of technology and built their services accordingly. For those without such access, these services became exceedingly more difficult to procure.

As newer technologies were introduced, research was performed on the impact on the digital divide. One such article analyzed the differences between urban and rural

communities in the US as 2G wireless was first introduced. As faster and better connectivity was made available using mobile devices, greater levels of access were much more easily achievable. However, this only effected those socio-economic groups that could afford such services and in areas where 2G service was available, almost inclusively in urban areas (Wareham, Levy, & Shi, 2004).

As new technologies are introduced, however, they make a significantly greater impact due to the level of inaccessibility in place in rural areas. One study analyzed the impact that tribal libraries in New Mexico had on their community as they adopted and then loaned out newer technologies. The libraries were the first and only source of access to broadband speeds and were able to share that accessibility via adoption of wireless technologies (Dorr & Akeroyd, 2001).

Research studies also included ways indicating how rural communities can greatly benefit from the application of ICTs to diminish the effects of distance (Malecki, 2003). As discussed earlier about e-government, users of technology are no longer constrained by geographic distance in order to make their voices heard. This is even more apparent to rural communities that often lose their voices in larger debates. By using technology, rural communities can keep current on the latest news and events and have a forum to discuss their issues and concerns to bring them to the attention of policy makers. However, if rural communities do not have such access, they are excluded from this conversation, thus adversely affecting those communities (Mathur & Ambani, 2005).

In rural Africa, the introduction of ICTs provided a significant benefit through telemedicine in areas that had little to no healthcare available at all (Mbarika, 2004). With the introduction of broadband service, rural communities were then able to gain access to

medical information that had been readily available online for years. Rural medical personnel were able to collaborate with peers anywhere in the world instantly, gaining new insight into medical procedures that were more cost effective while maintaining high levels of effectiveness. Experts could weigh in on difficult cases without ever having to leave their office. For rural Africa, which was struggling with having little to no trained medical personnel, telemedicine provided a quick, efficient method by which the best doctors and specialists from around the world could be consulted and a diagnosis made quickly. This would give access to vetted specialists within their field, without resorting to additional sources that may not have been vetted by an outside agency.

Some research has begun in analyzing methods to provide greater levels of access to poor and rural areas. With greater adoption of wireless technologies, many areas surrounded by significant geographic barriers are now able to gain access at an affordable rate. Moreover, broadband speeds are often available through this wireless connection (Dang, 2008).This is described by Dang in Bangladesh, where the Grameen Village Phone was introduced to connect rural areas that are significantly far from an urban centers.

Boris approached this access between rural and urban areas as the key definition between whether the digital divide is closing or widening. As rural areas catch up to their urban counterparts, the author felt that this was indicative of the divide itself and whether true gains were being made or whether it was the same story with the technology haves still outpacing the technology have-nots (Boris, 2005). “One of the major reasons that large portions of the rural population did not have early access to high-speed Internet was due to the limitations of the type of broadband service originally available (Boyce, 2000).

The rural telephone company could not extend this technology more than three miles from a switching station without a tremendous investment in equipment" (Boris, 2005, p. 15).

People

As the discussion on human capital expands, another area of interest is the consideration of shifting the primary focus of digital divide issues from a technology focus and towards a focus on the people affected by the divide. By shifting the focus towards communities and people, the hypothesis is that better solutions will be discovered instead of trying a one-size-fits-all solution that is often used when the focus is only on technology (Salinas, 2003).

As discussed earlier, communities and people adopt technology differently. Research was done in order to highlight this fact and recommend that the discussion include people and the divide issues that they are facing instead of merely reviewing what technology is currently available and ways that it can be made readily available (Bonfadelli, 2002). As this shift occurs, better solutions will often be found that address the divide at the intersection between people and technology instead of merely providing people with technology and calling it a solution.

Several researchers discuss how even for people that have access, they should be made aware that information is not free. There is some form of cost associated with the production of information, whether it is human capital, financial, or the opportunity cost associated with producing the information. Unfortunately, many people never stop to count the cost associated with gaining access to online resources and with producing those resources and making them available (Chabran, 2000; Loosen, 2002). By informing

people of the costs associated with producing information as well as making it available online, it is hoped that those groups with access will realize the resources that it takes to produce information and the value, whether intrinsic or extrinsic, associated with these online resources.

Some researchers have gone so far as to say that the focus on purely technological methods to bridge the divide has been a deliberate move away from focusing on the people (Stevenson, 2009). By keeping the discussion in the purely technological domain, groups are able to minimize the true costs associated with not having access to online resources. Keeping the discussion focused on technology also allows groups to postulate much easier solutions in bridging the divide than would otherwise be formulated. By introducing people and their communities into the equation, simplistic formulas and solutions become much more convoluted and the divide begins to take on an aspect that is much more harmful to those groups that do not have access.

By focusing on people, other social inequalities begin to emerge that exacerbate digital divide issues. One such study reviewed demographics as a path to determine whether an individual would have access to online information. This idea, similar to social exclusion, allowed for different variables to emerge in terms of what impacts the level of access that many groups possess (Selwyn, 2004). Taking it one step further, some research polarized the issue by examining the gap between whites and non-whites in eastern North Carolina and used a bivariate regression model to look for the relationship between race and those with or without access (Wilson, Wallin & Reiser, 2003).

As these ideas began to be disseminated, other researchers began to do additional studies to follow up on the earlier works. One such study examined what kinds of

technology would be most useful to specific groups and specific cultures. By addressing the issue of people where they live, more specific concerns and possible solutions were able to be postulated (Berube, 2006). By including the idea of the community, people could then become part of the solution. Instead of merely making educated hypothesis and applying the results, researchers recommended actually approaching people in the community and including them in the discussion from the start. This allowed for both realistic approaches into what the problems actually looked like at the ground level while giving the community the opportunity to buy into the solution, so that the people became part of the process used to discover that solution (DiMaggio, Hargittai, Neuman & Robinson, 2001). Additional research on the interactions between technology and communities examined methods by which technological advances could be made available to the widest group for the smallest investment ("Behind the Digital," 2005).

Included in this discussion was how the younger generation adopts technology quickly and learns to work around issues such as filtering (Farrelly, 2011). When analyzing a community at the ground level, methods for the introduction of technology will vary significantly. "Today, kids are walking around with more computer processing power in their phones than I had in my library school-era laptop. A young adult who can't access a site on a library computer need only pull it up on a 4G network with comparable speeds and perhaps (depending on the library) better audio and visual options" (Farrelly, 2011, p. 28). Libraries can use this information and build educational programs accordingly. If their community consists of greater numbers of young adults, then the library staff may be able to do much quicker introductions to the technology and build ways to introduce better or more advanced computer skills.

Another method of research into people is an analysis of how they are accessing online resources. For those most connected, research has found that many of the advanced technology users' connect from at least two different locations (Harwood & Rainie, 2004). However, for many users, the number of connections was even greater. These findings indicate that multiple methods of access should be made available in order to increase the amount of use made of online resources. One of these connections should be available at home. Research found that a person with access at home was much more likely to use that connection than someone who used a connection at a library or school (Hassani, 2006). "By a large margin, users who connect at home, work, and at one or more other places have the greatest odds of searching for health information, searching for product information, banking, and making purchases online" (Hassani, 2006, p. 261).

In terms of solutions, several researchers focused on small, specific communities, such as those in India, in order to ascertain some possible solutions (James, 2001a; James, 2001b; Curry & Kenney, 2006). Much of this research was done globally, as the divide is much more significant in lesser developed countries. Many of the findings revealed that even when the focus was small, the impact could be significantly larger. One method to increase the impact of local solutions is to develop small-scale projects that can be networked. For example, small internet centers could be developed within a small town, which could then be used as a connection point to another small town. This gives a greater benefit to the local community while providing a longer-term solution for the region, and ultimately, the country.

Democracy

Democracy is the key idea within this paper, and while it is often discussed, it is rarely used in conjunction with analysis in terms of the impacts on the divide. This presents an opportunity for further discussion and analysis into the variables that affect the digital divide and could have future policy implications.

A number of studies discuss democracy and the digital divide. However, most of them take a qualitative approach and look at more loosely associated variables (Jaeger & Burnett, 2005; Curry & Kenney, 2006; Herb, 2010). Only two studies were found that used a quantitative method when discussing democracy and the digital divide, Guillén and Suárez (2005) and Robison and Crenshaw (2010), and neither of these studies was in the LIS field. Guillén and Suárez were from Sociology whereas Robison and Crenshaw were from Political Science. Both of these studies did, however, use a very broad definition of democracy, thus impeding the parsimony of the regression models they used. While similar variables were present, such as the number of Internet users and Freedom House scores, other variables were not, such as foreign direct investment (FDI). The gap in research presents an opportunity to study the relationship between democracy and the divide in more detail while keeping the model in a simple form.

When some authors approached the idea of democracy, they shifted their focus to broader topics. One such discussion was on power—political, social, and cultural (Moss, 2002). The article approached the digital divide in terms of power and how the divide is often yet another manifestation between those with power and those without it. As Moss stated a person's power is their ability to improve their future by using their current

advantages (Moss, 2002). The power of online resources is the power to improve a future outcome using technology.

Other discussions focused on the impact that the digital divide had on democracy. One such article stated that an individual, at minimum, must have enough information to determine which choice in elections is preferable for his or her situation. Many groups that are far from the centers of government with no access to online information are often bereft of enough unbiased information resources to be able to make an intelligent decision on which candidate fits most closely to their ideals and morals. Voter's guides, such as the one built by the Office of the Secretary of State in Washington, lists which candidates are running as well as some links to information about them (*Voters' Guide*, n.d.). While libraries can be used as mediums to disseminate information in an unbiased manner, in many rural communities, especially in developing countries, a library is not accessible or does not have any connectivity to online materials (Webster, 1999).

The relationship between democracy and the digital divide is important. As Dervin (1994) stated, "Good democracy is critically dependent upon having access to good information" and yet one of the greatest channels for information is unavailable for much of the world. By being denied access to the plethora of information available online, governments are able to silence or marginalize dissidents before they have an opportunity to make their voices heard. One of the first acts of governments under siege after the Arab Spring was under way, such as in Tunisia and Egypt, was to turn off ICT access. By silencing one of the largest forms of communication via use of the Internet, the governments hoped to curtail the spread of information and thus contain the spread of the uprisings (Labovitz, n.d.).

> On the evening of January 27, 2011 Egypt—a population of 80 million, including 23 million Internet users—vanished from the Internet. The Egyptian government ordered a complete Internet shutdown amidst popular anti-government protests calling for the resignation of Egyptian President Hosni Mubarak. (Dainotti et al., 2011, p. 1)

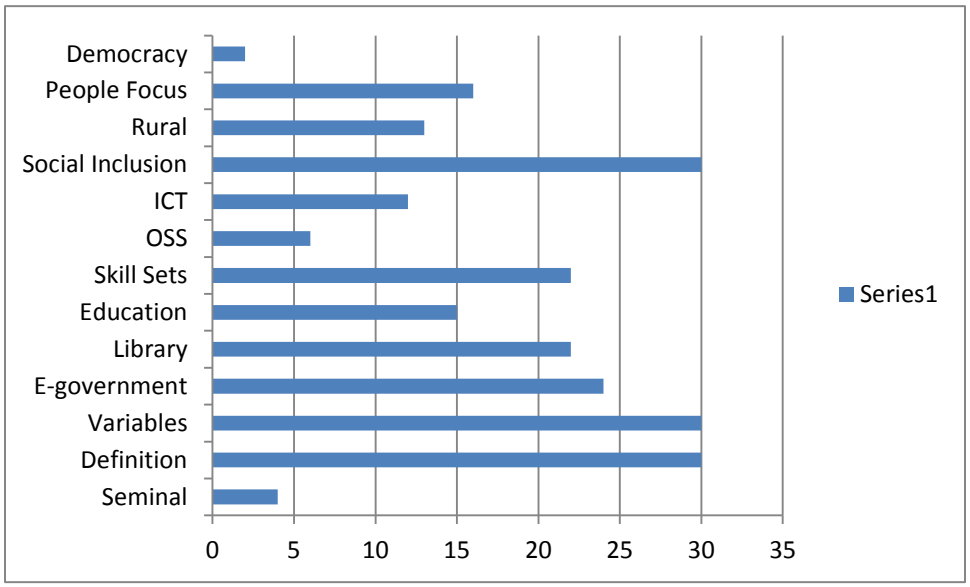
Additional research is needed to examine what other factors significantly impact the divide to find ways to address divide-related issues on an international platform. Where conditions prevail that are outside the ability of NGOs and governments to address, there may need to be indices built that indicate what the best solution to address the divide may be based upon outside assistance. This could lead to better use of resources as some areas and groups would benefit more from outside assistance than other groups, thus giving investors a greater impact from their investment. Such impacts could include greater levels of accessibility for rural communities, greater access speeds, and greater economic benefits for local businesses. As one author stated, a multitude of voices is necessary in order to fully engage in a pluralist democracy (Lievrouw, 1994).

This study will fill the gap left by the previous research. This study will build a statistical model to determine the strength of the relationship between democracy and access to technology. The results of the findings could be used to affect policy making decisions in terms of the digital divide. By determining which variables have the greatest impact on the digital divide, policy makers could make better informed decisions on where to invest resources to help bridge the divide. With some variables outside of the control of outside investors, it will be helpful to find which variables have the greatest

impact and which ones can be impacted by outside forces, such as access to technology or improved infrastructure, and which ones cannot be impacted, such as democracy.

The following table reflects the amount of research that has been done in the different areas and highlights the lack of research done in regards to democracy and the digital divide.

Table 2.1Matrix of Articles about the Digital Divide



This dearth of research into the effects of democracy on the digital divide provides an excellent research opportunity. By building a mathematical model, the strength of the relationship between freedom and internet access will be explored. This relationship will assist in explaining additional variables that impact the number of internet users within a country as well as the strength of that impact.

CHAPTER 3

METHODOLOGY TO DECODE THE DIGITAL DIVIDE

The digital divide is a highly complex issue, with a number of variables involved in its measurement. Measuring the digital divide is a controversial topic in and of itself, with little theoretic direction in many studies. This lack of theoretical guidance exacerbates an already contested discussion. A general theme has been agreed upon—though some authors disagree with the methodology currently being used; for example, James's discussion on shifting the discussion from using an additive formula to a multiplicative one (James, 2008b)—and the fundamental variables that have been discovered. Previous research has found that age, socio-economic status, race, and gender have significant impacts on whether an individual has access to online resources or not.

However, the research has not been broken down to look at other factors that affect the digital divide. The focus still hangs on the question of whether an individual has access to technology or not, with little other research being discussed. Some researchers have begun to discuss other outside factors that have an impact on the divide and the ways to make small changes that could have a positive impact on making information available via online resources. One such factor is making more information available via open access. "Open access journals and repositories empower libraries with free access to a broad scope of current research materials and data and ensure that local content is widely distributed around the world" (Usova, 2009, p. 247).

This study uses a quantitative methodology, as the answers from this study are important for application to the general public. While the digital divide is an issue that is heavily involved with people and could use qualitative methods, the focus of this study is best served via quantitative methods. The primary model will use an ordinary least squares (OLS) regression model, including variables such as number of Internet users, mobile phone users, levels of democracy, socio-economic status, and education levels within a country. The use of an OLS model will be the primary vehicle to determine statistical significance due to its smaller levels of error compared with other regression models.

The primary variables used to determine access will be numbers of Internet users and mobile phone users. The number of Internet users is the primary variable being researched, but given the widespread use of mobile technology to connect to online resources, the number of mobile users will also be included in a regression model. This model will test our hypothesis that as levels of freedom increase, the number of internet users per capita increases. In addition, this relationship is statistically significant.

Regression Models

A regression model was chosen in order to test for statistical significance between independent variables and a dependent variable. While a stronger level of significance does not indicate an absolute correlation between the variables, it is typically assumed that such a correlation is indicated by the findings and that the findings can be applied to the general population. A regression function is defined as "a mathematical function that describes how the mean of the response variable changes according to the value of the explanatory variable" (Agresti & Finlay, 2009, p. 267).

Specifically, the regression model to be used will be an OLS regression model. Statistical significance, or α – level, is a value where if the P-value is less than or equal to H_0, then we reject the H_0. Statistical significance is determined using mathematical tests to discover whether the sample estimate could have occurred regardless of our population value, including a value of zero. "The P-value is "the probability that the test statistic equals the observed values or a value even more extreme in the direction predicted by H_a. It is calculated by presuming that H_0 is true" (Agresti & Finlay, 2009, p. 145). In these definitions, H_0 is the hypothesis being tested by the regression model. In this case, the hypothesis is that the level of democracy within a country *does not affect* the level of access to online resources. The alternative hypothesis, denoted by H_a, is that the level of democracy within a country *does affect* the level of access to online resources. A regression model only tests against the primary hypothesis and its alternative. An OLS regression model is also one of the best estimators as long as some basic assumptions are followed.

An OLS regression model will return a coefficient of determination, or R squared, where the value is representative of the strength of the relationship between the independent and dependent variables. The coefficient of determination is the ratio of the explained sum of squares to the total sum of squares. The equation for R^2 is : $R^2 =$ ESS/TSS. The explained sum of squares is "the summation of the squared values of the difference between the predicted Ys (Y - ê) and the mean of Y (μ_Y, a naive estimate of Y)" ("4- How to Evaluate," n.d.). The total sum of squares is the "summation of the

squared values of the difference between the actual Ys and the mean of Y" ("4- How to Evaluate," n.d.).

As R^2 is a ratio between two different values, the value for R^2 ranges between 0 and 1. This value is typically reported as a percentage value. The value of R2 explains the goodness of the fit of the regression model being used. A higher R^2 score indicates that the regression line being used is a good estimate of the real data points. As Nagelkerke (1991) stated, "Its definition as the proportion of variance 'explained' by the regression model makes it useful as a measure of success of predicting the dependent variable from the independent variables" (p. 691).

Stata 12/IC will be used as the regression software to run the model. This software package is one of the more popularly used programs in terms of regression analysis, such as those performed by Robison and Crenshaw (2010) as well as Guillén and Suárez (2005). It allows for robust regression analysis, as well as tests for heteroscedasticity and a number of graphical plots. The test for heteroscedasticity is important as one of the primary assumptions in using an OLS model is that there is no heteroscedasticity present in the model. In addition, another assumption is that the variables follow a linear progression. By using the plotting tools readily available within Stata, this assumption was verified as well.

Model Assumptions

An OLS regression model must follow a specific set of assumptions in order to give a reliable result while testing for a relationship. While these assumptions can be violated, those violations can introduce additional errors into the regression model, thus introducing the possibility of returning an erroneous result from the regression model

being used. The classic assumptions when using an OLS regression model are as follows (Kaplan, n.d.):

1. The regression is a linear function.
2. Error term has a zero population mean.
3. The error term is not correlated with any of the independent variables.
4. There is no serial correlation.
5. There is no heteroscedasticity present in the model.

The first assumption is that the regression is a linear function. This interprets into a visual where the relationship between the independent and dependent variables is a denoted by a straight line. While a function that is represented by a curved line can be calculated, the function cannot be properly represented in an OLS regression model. Some mathematical functions can be applied to the data sets in order to help them fit into a linear progression. Oftentimes, the data sets can have a log function applied to them, which will adjust the function into a linear one. While this does introduce some additional levels of error into the equation, the levels are typically such that it does not significantly affect the findings of the regression model.

The second assumption is that the error term has a zero population mean. As Graddy and Wang (2008) state, "This means that we believe we have included all important nonrandom determinants of the dependent variable in our model" (p. 477). This is one assumption that can have a large impact on the findings of the model if it is violated. However, it is easily corrected "by adding or subtracting the sample error mean to the intercept" (Graddy & Wang, 2008, p. 477). This effectively forces the error term to

have a zero mean. While this correction does introduce some additional level of error, the parsimony of the OLS regression model is such that this new level of error is negligible.

The third assumption is that the error term is not correlated with any of the independent variables. In other words, the error term is not linked or related to any of the independent variables, but is completely independent unto itself. Therefore, "explanatory variables are determined outside of the model" (Kaplan, n.d.). Should the error term be correlated to any of the explanatory, or independent, variables, the error term will increase much faster as the independent variable increases, thus introducing a much higher level of error into the model than should be present.

The fourth assumption is that there is no serial correlation in the regression model. When error terms from different (usually adjacent) time periods (or cross-section observations) are correlated, we say that the error term is *serially correlated*. Serial correlation occurs in time-series studies when the errors associated with a given time period carry over into future time periods. For example, if we are predicting the growth of stock dividends, an overestimate in one year is likely to lead to overestimates in succeeding years" (*Serial Correlation*, n.d.).

The final classical assumption is that there is no heteroscedasticity present in the model. Violations of homoscedasticity make it difficult to gauge the true standard deviation of the forecast errors, usually resulting in confidence intervals that are too wide or too narrow. In particular, if the variance of the errors is increasing over time, confidence intervals for out-of-sample predictions will tend to be unrealistically narrow. Heteroscedasticity may also have the effect of giving too much weight to small subset of the data (namely the subset where the error variance was largest) when estimating

coefficients. (*Testing the Assumptions*, n.d.) This error can be fixed using a variety of methods.

The issue with heteroscedasticity is that "The standard errors of the estimates are biased if we have heteroscedasticity. If the standard errors are biased, we cannot use the usual t statistics or F statistics or LM statistics for drawing inferences. OLS, even if standard errors could be correctly measured, is no longer efficient" (*Heteroscedasticity*, n.d.).

This explanation about the OLS model is important in order to discuss why an ordinary least squares model was used and the methods used to ensure a correct model was built. A greater understanding of the model ensures that the assumptions required for the model to work properly are examined and why this examination is important. An ordinary least squares model allows for the least amount of error to be introduced into the model while still testing for statistically significant results.

Independent and Dependent Variables

For the model, the independent variable is democracy and the number of internet users per capita is the dependent variable. Democracy is defined by using several factors. These factors are the freedom rankings found by Freedom House, the gross domestic product and foreign direct investment of a country, and the data set built by researchers Geddis, Wright and Frantz, that adds a finer level of granularity to autocratic countries based on the Freedom House rankings.

By being careful with the model for the regression analysis, these assumptions can easily be followed, thus allowing for use of the OLS model. The independent variables will be built to define democratic ideals while the dependent variable will be the

percentage of the number of online users within a country in relation to its total population. This per capita number will be used as a method to stabilize the effects of population. While some countries may have a small number of Internet users, it may also have a corresponding small population, which would not be accounted for by using the number of Internet users. The number of online users will be obtained through data from the International Telecommunications Union (ITU).

The ITU is the forerunner in gathering international data on a variety of telecommunications topics. “ITU's World Telecommunication/ICT Indicators Database is the main source of global, and internationally comparable, telecommunication/ICT statistics. It includes time series for more than 140 indicators and around 200 economies. The data are collected directly from telecommunication regulatory agencies and/or ministries and national statistical offices by means of an annual questionnaire, and subsequently verified, harmonized and complemented by ITU” ("World Telecommunication/ICT Indicators," n.d.). ITU is the world leader in monitoring the telecommunications industry and gathering quantitative data from each country.

While the data being used is secondary data, the reputation of the ITU is unparalleled in regards to international telecommunications data. Most global agencies, such as The World Bank, use ITU as their primary data source for telecommunication data (*Internet Users per*, n.d; "World Telecommunication/ICT Indicators," n.d.). In addition, much of the data that is gathered by ITU is submitted directly from telecommunication firms within each country, thus providing an inside viewpoint on what is actually happening within a country as opposed to using data presented by the public relations groups of a government. The volume of data available through ITU

cannot realistically be gathered by a single researcher in a realistic timeframe. “It includes time series for more than 140 indicators and around 200 economies. The data are collected directly from telecommunication regulatory agencies and/or ministries and national statistical offices by means of an annual questionnaire, and subsequently verified, harmonized and complemented by ITU” ("World Telecommunication/ICT Indicators," n.d.).

The measurements of democracy will also be gathered using secondary data. In this case, the levels of democracy will include rankings of democracy gathered from Freedom House, which is one of the acknowledged leaders in gathering data and ranking countries on their levels of democracy. This ranking is based upon two primary subcategories: political rights and civil liberties. According to the Freedom House’s 2012 report on democracy in the world, the countries are ranked as shown in Table 3.1.

Table 3.1
Freedom Housing rankings of countries, based on freedom status, political rights, and civil liberties

Country	Freedom Status	PR	CL	Trend
Afghanistan	Not Free	6	6	↓
Albania	Partly Free	3	3	↓
Algeria	Not Free	6	5	
Andorra	Free	1	1	
Angola	Not Free	6	5	
Antigua and Barbuda	Free	3	2	
Argentina	Free	2	2	
Armenia	Partly Free	6	4	
Australia	Free	1	1	
Austria	Free	1	1	
Azerbaijan	Not Free	6	5	↓
Bahamas	Free	1	1	
Bahrain	Not Free	6	6	
Bangladesh	Partly Free	3	4	↓
Barbados	Free	1	1	
Belarus	Not Free	7	6	
Belgium	Free	1	1	
Belize	Free	1	2	
Benin	Free	2	2	
Bhutan	Partly Free	4	5	
Bolivia	Partly Free	3	3	

Bosnia and Herzegovina	Partly Free	4	3	
Botswana	Free	3	2	
Brazil	Free	2	2	
Brunei	Not Free	6	5	
Bulgaria	Free	2	2	
Burkina Faso	Partly Free	5	3	
Burma	Not Free	7	6	
Burundi	Partly Free	5	5	
Cambodia	Not Free	6	5	
Cameroon	Not Free	6	6	
Canada	Free	1	1	
Cape Verde	Free	1	1	
Central African Republic	Partly Free	5	5	
Chad	Not Free	7	6	
Chile	Free	1	1	
China	Not Free	7	6	↓
Colombia	Partly Free	3	4	
Comoros	Partly Free	3	4	
Congo (Brazzaville)	Not Free	6	5	
Congo (Kinshasa)	Not Free	6	6	
Costa Rica	Free	1	1	
Côte d'Ivoire	Not Free	6	6	
Croatia	Free	1	2	
Cuba	Not Free	7	6	
Cyprus	Free	1	1	
Czech Republic	Free	1	1	
Denmark	Free	1	1	
Djibouti	Not Free	6	5	↓
Dominica	Free	1	1	
Dominican Republic	Free	2	2	
East Timor	Partly Free	3	4	

Ecuador	Partly Free	3	3	↓
Egypt	Not Free	6	5	↑
El Salvador	Free	2	3	
Equatorial Guinea	Not Free	7	7	
Eritrea	Not Free	7	7	
Estonia	Free	1	1	
Ethiopia	Not Free	6	6	↓
Fiji	Partly Free	6	4	
Finland	Free	1	1	
France	Free	1	1	
Gabon	Not Free	6	5	
The Gambia	Not Free	6	5	
Georgia	Partly Free	4	3	
Germany	Free	1	1	
Ghana	Free	1	2	
Greece	Free	2	2	
Grenada	Free	1	2	
Guatemala	Partly Free	3	4	
Guinea	Partly Free	5	5	
Guinea-Bissau	Partly Free	4	4	
Guyana	Free	2	3	
Haiti	Partly Free	4	5	
Honduras	Partly Free	4	4	
Hungary	Free	1	2	
Iceland	Free	1	1	
India	Free	2	3	
Indonesia	Free	2	3	
Iran	Not Free	6	6	↓
Iraq	Not Free	5	6	
Ireland	Free	1	1	
Israel	Free	1	2	↓
Italy	Free	1	1	

Jamaica	Free	2	3	
Japan	Free	1	2	
Jordan	Not Free	6	5	
Kazakhstan	Not Free	6	5	↓
Kenya	Partly Free	4	3	
Kiribati	Free	1	1	
Kosovo	Partly Free	5	4	
Kuwait	Partly Free	4	5	
Kyrgyzstan	Partly Free	5	5	
Laos	Not Free	7	6	
Latvia	Free	2	2	
Lebanon	Partly Free	5	4	
Lesotho	Partly Free	3	3	
Liberia	Partly Free	3	4	
Libya	Not Free	7	6	
Liechtenstein	Free	1	1	
Lithuania	Free	1	1	
Luxembourg	Free	1	1	
Macedonia	Partly Free	3	3	
Madagascar	Partly Free	6	4	
Malawi	Partly Free	3	4	↓
Malaysia	Partly Free	4	4	
Maldives	Partly Free	3	4	
Mali	Free	2	3	
Malta	Free	1	1	
Marshall Islands	Free	1	1	
Mauritania	Not Free	6	5	
Mauritius	Free	1	2	

Mexico	Partly Free	3	3	
Micronesia	Free	1	1	
Moldova	Partly Free	3	3	
Monaco	Free	2	1	
Mongolia	Free	2	2	
Montenegro	Free	3	2	
Morocco	Free	5	4	
Mozambique	Partly Free	4	3	
Namibia	Free	2	2	
Nauru	Free	1	1	
Nepal	Partly Free	4	4	
Netherlands	Free	1	1	
New Zealand	Free	1	1	
Nicaragua	Partly Free	5	4	
Niger	Partly Free	3	4	
Nigeria	Partly Free	4	4	
North Korea	Not Free	7	7	
Norway	Free	1	1	
Oman	Not Free	6	5	
Pakistan	Partly Free	4	5	↓
Palau	Free	1	1	
Panama	Free	1	2	
Papua New Guinea	Partly Free	4	3	
Paraguay	Partly Free	3	3	
Peru	Free	2	3	
Philippines	Partly Free	3	3	
Poland	Free	1	1	
Portugal	Free	1	1	
Qatar	Not Free	6	5	
Romania	Free	2	2	

Russia	Not Free	6	5	
Rwanda	Not Free	6	5	
Saint Kitts and Nevis	Free	1	1	
Saint Lucia	Free	1	1	
Saint Vincent and Grenadines	Free	1	1	
Samoa	Free	2	2	
San Marino	Free	1	1	
São Tomé And Príncipe	Free	2	2	
Saudi Arabia	Not Free	7	7	
Senegal	Partly Free	3	3	
Serbia	Free	2	2	
Seychelles	Partly Free	3	3	
Sierra Leone	Partly Free	3	3	
Singapore	Partly Free	4	4	
Slovakia	Free	1	1	↑
Slovenia	Free	1	1	
Solomon Islands	Partly Free	4	3	
Somalia	Not Free	7	7	
South Africa	Free	2	2	
South Korea	Free	1	2	
South Sudan	Not Free	6	5	
Spain	Free	1	1	
Sri Lanka	Partly Free	5	4	
Sudan	Not Free	7	7	↓
Suriname	Free	2	2	
Swaziland	Not Free	7	5	
Sweden	Free	1	1	
Switzerland	Free	1	1	
Syria	Not Free	7	7	
Taiwan	Free	1	2	
Tajikistan	Not Free	6	5	
Tanzania	Partly Free	3	3	
Thailand	Partly Free	4	4	
Togo	Partly Free	5	4	
Tonga	Partly Free	3	3	
Trinidad and Tobago	Free	2	2	
Tunisia	Partly Free	3	4	
Turkey	Partly Free	3	3	
Turkmenistan	Not Free	7	7	
Tuvalu	Free	1	1	
Uganda	Partly Free	5	4	↓
Ukraine	Partly Free	4	3	
United Arab Emirates	Not Free	6	6	
United Kingdom	Free	1	1	
United States	Free	1	1	
Uruguay	Free	1	1	
Uzbekistan	Not Free	7	7	
Vanuatu	Free	2	2	
Venezuela	Partly Free	5	5	
Vietnam	Not Free	7	5	
Yemen	Not Free	6	6	
Zambia	Partly Free	3	4	↑
Zimbabwe	Not Free	6	6	

Source: *Freedom in the World*, 2012, p. 16.

Freedom House uses several variables in determining the rankings for political rights and civil liberties. These two categories are then used to determine the ranking of its level of democracy. The rankings for democracy are broken into three categories: Free, Partly Free, or Not Free.

> *Freedom in the World* applies one of three broad category designations to each of the countries and territories included in the index: Free, Partly Free, and Not Free. A Free country is one where there is open political competition, a climate of respect for civil liberties, significant independent civic life, and independent media. A Partly Free country is one in which there is limited respect for political rights and civil liberties. Partly Free states frequently suffer from an environment of corruption, weak rule of law, ethnic and religious strife, and a political landscape in which a single party enjoys dominance despite a certain degree of pluralism. A Not Free country is one where basic political rights are absent, and basic civil liberties are widely and systematically denied. (*Freedom in the World*, 2012, p. 16)

Countries ranked as Free include the United States, The United Kingdom, Sweden, France, and Germany to name a few. A few countries ranked as Partly Free include Paraguay, Senegal, Sri Lanka, and Thailand. Syria, Swaziland, Oman, and Libya are examples of countries that are ranked as Not Free.

Political rights and civil liberties are each given a score between 1 and 7. Those countries with the greatest levels of freedom in each category receive a rank of 1, whereas countries with significant repression of rights and oppressive laws that limit the

freedoms of its citizens receive a higher rank, with the worst score being a 7. These scores are then averaged in order to be placed under a ranking based on their freedoms.

> The average of the political rights and civil liberties ratings, known as the freedom rating, determines the overall status: Free (1.0 to 2.5), Partly Free (3.0 to 5.0), or Not Free (5.5 to 7.0). Freedom House also assigns upward or downward trend arrows to countries which saw general positive or negative trends during the year that were not significant enough to result in a ratings change. (*Freedom in the World*, 2012, p. 33)

Countries such as Zambia, Egypt, and Slovakia have each made gains in these ratings, whereas Uganda, Iran, and Pakistan have incurred losses.

Each of these scores is based upon different criteria. "Political rights ratings are based on an evaluation of three subcategories: electoral process, political pluralism and participation, and functioning of government" (*Freedom in the World*, 2012, p. 33). In addition, several discretionary questions are included in the political rights ratings. The electoral process subcategory consists of three individual questions, including how or if government officials are elected and whether the laws used to conduct those elections are fair. The political pluralism subcategory includes four questions that cover topics such as if the people have the right to organize political parties on their own and whether minority groups have the same political rights as those in the majority as well as whether people are free from domination for their political choices and whether minority groups have full political rights. The subcategory on the functioning of government includes three questions: 1) Who determines the policies of the government? 2) How rampant is corruption? and 3) Is there accountability and transparency in the government?

The civil liberties categories follow similar themes. “Civil liberties ratings are based on an evaluation of four subcategories: freedom of expression and belief, associational and organizational rights, rule of law, and personal autonomy and individual rights” (*Freedom in the World*, 2012, p. 33).

The freedom of expression category consists of four questions: 1) Is there an independent media? 2) Are faith communities free to follow their own tenets? 3) Does academic freedom exist? and 4) Can there be open private discussions by the citizens?

The organizational rights category covers whether the citizens can assemble and demonstrate freely, if trade unions available, and if non-governmental organizations are free to address the needs of the people.

The rule of law category covers topics such as whether the judiciary is independent, whether the rule of law prevails in legal matters, and whether all groups get equal treatment under the law.

The individual rights category covers such topics as whether people can freely travel and make their own choices in regards to education and job selection, if individuals can own property, evidence of social freedom, and the absence of exploitation of workers.

As each of the questions is answered, a scored is assigned to each answer.

> The ratings are determined by the total number of points (up to 100) each country receives on 10 political rights questions and 15 civil liberties questions; countries receive 0 to 4 points on each question, with 0 representing the smallest degree and 4 the greatest degree of freedom” (*Freedom in the World*, 2012, p. 33).

Democracy also includes a number of different variables, dependent upon who is reviewing the term and the way it is being applied. The definition that will be used is based upon the rankings of the two previously discussed bodies, as well as gross domestic product (GDP) and foreign direct investment (FDI).

Another measure of democracy that is often used is the gross domestic product of a country. In general, the greater the level of freedom within a country, the greater its economic success. " Nations with higher degrees of economic freedom prosper because they capitalize more fully on the ability of the free-market system not only to generate, but also to reinforce dynamic growth through efficient resource allocation, value creation, and innovation" (Miller & Kim, 2014). This variable data will be retrieved from the World Bank, which is a leader in gathering financial data from the countries of the world and aggregating it. The World Bank is an NGO and brings with it less bias in terms of the data that it releases.

GDP can be defined as

> …one of the primary indicators used to gauge the health of a country's economy. It represents the total dollar value of all goods and services produced over a specific time period... (*What Is GDP and Why Is It so Important?*, n.d.)

GDP is considered an important factor in democratization as typically the greater the GDP, the greater levels of freedom enjoyed by the populace. Higher levels of GDP allowing for purchases of technology that help to expand access to information, which has a direct impact on GDP as found in an article in the *Business Standard,* "Growing numbers of Internet and broadband connections can give the Indian economy the much-

needed fillip by adding $17 billion to the gross domestic product (GDP) annually" (*Internet Penetration to Boost*, 2012).

GDP is also affected by access to online resources. As found in a recent report by Hazan et al., "The profit levels of these Internet-intense companies were 10 percent higher than those of less intense Web users, and the rate at which they added workers was twice as high" (Hazan, Manyika, & Du Rausas, 2011).

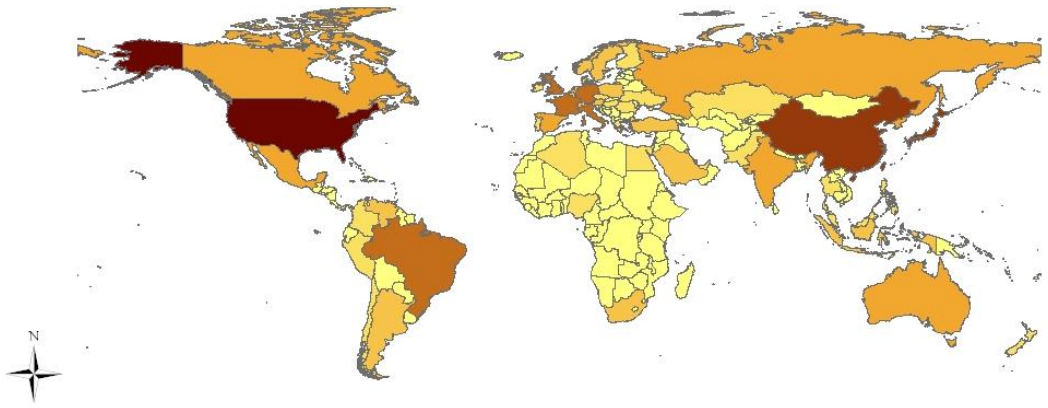


Figure 3.1 Gross domestic product (GDP) worldwide, 2010

Source: Polity IV Project (n.d.)

A well-functioning government is essential to a democratic state and a strong economy. GDP is an economic measure of the strength of an economy. "Some scientists argue that financial development is an important determinant for an economy to grow. A well-functioning financial system promotes private saving and private investment and leads to higher economic growth through the improved efficiency of investment" (Bobinaite, Juozapaviciene, & Konstantinaviciute, 2011, p. 116).

FDI will be included as a variable in the regression model in addition to GDP to measure economic growth within a country. "FDI has the positive relation with domestic investment and economic growth and FDI generates both significantly positive short-run

and long-run impacts on economic growth" (Chien & Zhang, 2012, p. 158). Agrawal and Khan (2011) state that FDI is "The acquisition of at least ten percent of the ordinary shares or voting power in a public or private enterprise by nonresident investors. Direct investment involves a lasting interest in the management of an enterprise and includes reinvestment of profits" (p. 257).

FDI is an important factor to review as part of democracy as the investments often allow for greater levels of access within a country by providing funding for technology that would otherwise be out of reach. "FDI has long been recognized as a major source of technology and know-how to developing countries. Indeed, it is the ability of FDI to transfer not only production know-how but also managerial skills that distinguishes it from all other forms of investment, including portfolio capital and aid" (Agrawal & Khan, 2011, p. 259).

FDI plays an important role in providing technology to further economic growth within a country where the investment is taking place and within the country from which the investment originated. "Within the past decade, however, there has been a dramatic increase in the number of technology startups and this**,** together with the rise in prominence of Internet usage, has fostered increasing changes in foreign investment patterns" (Graham & Spaulding, 2004). "FDI is a key force behind international economic integration and is considered to be an important driver of economic growth in OECD countries, because the internationalization of production helps to better exploit the advantages of enterprises, increase competitive pressures in OECD markets and stimulate innovative activity and technology transfer" (Pourshahabi, Mahmoudinia, & Soderjani, 2011, p. 72).

The FDI variable will be obtained from World Bank data. The World Bank monitors all FDI worldwide and aggregates that data. This data is also converted into a standard currency to facilitate easier levels of comparison. While some errors will occur based upon the fluctuations of currency exchanges, the overall validity of the data will be acceptable, given the smaller shifts in exchange rate values in relation to the amount of investment taking place worldwide.

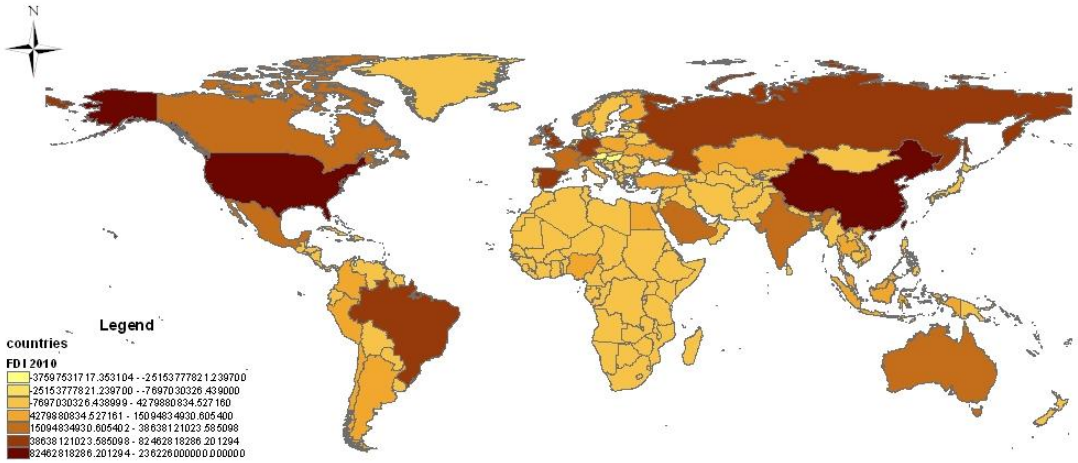


Figure 3.2 Global foreign domestic investment, 2010

Source: The World Bank

The variable for Internet access will be obtained via the ITU.

The June 2012 Edition of the database includes 2011 data for the following indicators **only**: Fixed-telephone subscriptions and per 100 inhabitants, Mobile-cellular telephone subscriptions and per 100 inhabitants, Active mobile-broadband subscriptions and per 100 inhabitants, Fixed (wired)-broadband subscriptions and per 100 inhabitants, International Internet bandwidth, in Mbit/s and per Internet user, Several indicators related to prices of fixed-telephone, mobile-cellular prepaid and fixed (wired)-broadband services, Percentage of

individuals using the Internet, Percentage of households with Internet, Percentage of households with computer. (*World Telecommunication/ICT Indicators*, n.d.)

While the number of individuals using the internet has increased globally, this growth has not been uniform. The following table indicates the number of individuals using the Internet and the percentage of individuals using the Internet. The first column indicates the country. The 2nd column indicates the number of individuals using the Internet in 2006, followed by the value for 2011. The 3rd column indicates the compound annual growth rate between 2006 and 2011. The 4th column indicates the percentage of individuals using the Internet in 2006, followed by the figure for 2011. The final column indicates compound annual growth rate between 2006 and 2011 for the percentage of individuals using the Internet,

Table 3.2
Percentage of individuals using the Internet (2006–2011)

	2006	2011	2006–2011	2006	2011	2006–2011
Afghanistan	598.9	1617.9	22	2.11	5	18.9
Albania	303.3	1575.8	39	9.61	49	38.5
Algeria	2463	5037.2	15.4	7.38	14	13.7
Andorra	39.1	69.8	12.3	48.94	81	10.6
Angola	324.5	2898.8	55	1.91	14.78	50.6
Antigua & Barbuda	53.2	73.5	6.7	62.64	82	5.5
Argentina	8166.6	19446.3	18.9	20.93	47.7	17.9
Armenia	172.9	472	39.8	5.63	15.3	39.5
Australia	13691.2	17858.5	5.5	66	79	3.7
Austria	5261.8	6713.9	5	63.6	79.8	4.6
Azerbaijan	1043.5	4653	34.8	11.99	50	33
Bahamas	84.3	225.7	21.8	26	65	20.1
Bahrain	229.2	1019.1	34.8	28.24	77	22.2
Bangladesh	1423.5	7524.7	39.5	1	5	38
Barbados	170.8	196.6	2.9	63	71.77	2.6
Belarus	1583.8	3785.5	19	16.2	39.6	19.6
Belgium	6255.7	8388.2	6	59.72	78	5.5
Belize	29.9	43.6	9.9[3]	10.4	14	7.7

Benin	121.1	318.5	21.3	1.54	3.5	17.9
Bhutan	30.5	155	38.4	4.52	21	36
Bolivia	577.1	3026.4	39.3	6.2	30	37.1
Bosnia and Herzegovina	950	2251.3	18.8	25.12	60	19
Botswana	81.5	142.2	11.8	4.29	7	10.3
Brazil	52963.6	88494.8	10.8	28.18	45	9.8
Brunei Darussalam	156.2	227.3	7.8	42.19	56	5.8
Bulgaria	2083.1	3797.5	12.8	27.09	51	13.5
Burkina Faso	92.5	509	40.6	0.63	3	36.5
Burundi	49.2	95.2	14.1	0.66	1.11	11
Cambodia	63.3	443.5	47.6	0.47	3.1	45.9
Cameroon	364.1	1001.5	22.4	2.03	5	19.8
Canada	23622.7	28510.1	3.8	72.4	83	2.8
Cape Verde	32.6	160.2	37.5	6.81	32	36.3
Central African Rep.	12.7	98.7	50.7	0.31	2.2	47.9
Chad	58.6	219	30.2	0.58	1.9	26.7
Chile	5681.3	9307.2	10.4	34.5	53.89	9.3
China	138335.4	516117.5	30.1	10.52	38.3	29.5
Colombia	6703.8	18958.6	23.1	15.34	40.4	21.4
Comoros	14.5	41.5	23.3	2.2	5.5	20.1
Congo	72.9	231.8	26	2.01	5.6	22.8
Congo (Dem. Rep.)	174.9	813.1	36	0.3	1.2	32.3
Costa Rica	1099.8	1990.8	12.6	25.1	42.12	10.9
Côte d'Ivoire	279.5	443.4	9.7	1.52	2.2	7.6
Croatia	1684	3108.1	13	37.98	70.71	13.2
Cuba	1257.1	2614.2	15.8	11.16	23.23	15.8
Cyprus	375.6	644	11.4	35.83	57.68	10
Czech Republic	4917	7686.9	9.3	47.93	72.97	8.8
D.P.R. Korea						
Denmark	4716.1	5015.3	1.2	86.65	90	0.8
Djibouti	10.5	63.4	43.4	1.27	7	40.7
Dominica	27.1	34.7	5.1	39.4	51.31	5.4
Dominican Rep.	1395.2	3569.9	20.7	14.84	35.5	19.1
Ecuador	982.1	4605.1	36.2	7.2	31.4	34.3
Egypt	9486	29399.6	25.4	12.55	35.62	23.2
El Salvador	334.1	1101.6	26.9	5.5	17.69	26.3
Equatorial Guinea	8	42	51.4	1.28	6	47.2
Eritrea	100.3	335.7	27.3	2.16	6.2	23.5
Estonia	853.6	1025.5	3.7	63.51	76.5	3.8
Ethiopia	236	932.1	31.6	0.31	1.1	28.8
Fiji	79.5	243.2	25.1	9.6	28	23.9

Finland	4194.8	4812.4	2.8	79.66	89.37	2.3
France	28767.9	50235.6	11.8	46.87	79.58	11.2
Gabon	76.7	122.7	9.9	5.49	8	7.8
Gambia	81	193.1	19	5.24	10.87	15.7
Georgia	334.4	1582.7	36.5	7.53	36.56	37.2
Germany	59558.1	68194.9	2.7	72.16	83	2.8
Ghana	603.7	3522.7	42.3	2.72	14.11	39
Greece	3618.2	6036.7	10.8	32.25	53	10.4
Grenada	22	35	12.2	21.4	33.46	11.8
Guatemala	847.3	1730.6	15.4	6.5	11.73	12.5
Guinea	58.7	132.9	17.8	0.64	1.3	15.3
Guinea-Bissau	28.7	41.3	7.6	2.06	2.67	5.4
Guyana	—	241.9	—	—	32	—
Haiti	644.2	836.4	6.7	6.8	8.37	5.3
Honduras	547.4	1233	17.6	7.8	15.9	15.3
Hungary	4736.2	5880	4.4	47.06	59	4.6
Iceland	269.4	308.2	2.7	89.51	95.02	1.2
India	32460.7	125018.2	31	2.81	10.07	29.1
Indonesia	10955.2	43618.6	31.8	4.76	18	30.5
Iran (I.R.)	6183	15707.7	20.5	8.76	21	19.1
Iraq	268	1633.2	43.5	0.95	5	39.3
Ireland	2316.9	3476.7	8.5	54.82	76.82	7
Israel	1883.4	5293.5	23	27.88	70	20.2
Italy	22445.3	34528	9	37.99	56.8	8.4
Jamaica	442.2	866.7	14.4	16.4	31.5	13.9
Japan	86862.7	100603.3	3	68.69	79.53	3
Jordan	762	2209.2	23.7	13.87	34.9	20.3
Kazakhstan	500.5	7293	70.9	3.27	45	69
Kenya	2752.9	11650.7	33.4	7.53	28	30
Kiribati	4.2	10.1	19.2	4.5	10	17.3
Korea (Rep.)	36916.1	40551.9	1.9	78.1	83.8	1.4
Kuwait	677	2091	25.3	28.79	74.2	20.8
Kyrgyzstan	625.6	1078.5	11.5	12.31	20	10.2
Lao P.D.R.	68.3	565.9	52.6	1.17	9	50.4
Latvia	1229.8	1607.9	5.5	53.63	71.68	6
Lebanon	614.6	2214.9	29.2	15	52	28.2
Lesotho	62.1	92.7	8.3	2.98	4.22	7.2
Liberia	...	123.9	...	...	3	...
Libya	253.5	1091.7	33.9	4.3	17	31.6
Liechtenstein	22.5	30.9	6.5	64.21	85	5.8
Lithuania	1491.7	2151.5	7.6	43.9	65.05	8.2

Luxembourg	337.6	468.9	6.8	72.51	90.89	4.6
Madagascar	112	405	29.3	0.61	1.9	25.6
Malawi	56.1	512.2	55.6	0.43	3.33	50.9
Malaysia	13728.6	17604.1	5.1	51.64	61	3.4
Maldives	33	108.8	26.9	11.04	34	25.2
Mali	99.2	316.8	26.1	0.73	2	22.3
Malta	166.1	289.2	11.7	40.41	69.22	11.4
Marshall Islands	2	1.9	-1.5	3.8	3.55	-2.2
Mauritania	30.7	159.4	39	0.98	4.5	35.7
Mauritius	211.5	456.7	16.6	16.7	34.95	15.9
Mexico	21049.4	41497.8	14.5	19.52	36.15	13.1
Micronesia	14	22.2	12.2	12.75	20	11.9
Moldova	728.9	1347	13.1	19.62	38	14.1
Monaco	21.7	26.6	5.2[3]	61.48	75	5.1
Mongolia	—	560	—	—	20	—
Montenegro	181.2	252.9	6.9	28.9	40	6.7
Morocco	6070.2	16459.2	22.1	19.77	51	20.9
Mozambique	179.5	1029	41.8	0.84	4.3	38.5
Myanmar	84.8	473.7	41.1	0.18	0.98	40
Namibia	93.2	278.9	24.5	4.4	12	22.2
Nauru	—	0.6	—	—	6	—
Nepal	317.7	2743.7	53.9	1.14	9	51.1
Netherlands	13708.4	15381.6	2.3	83.7	92.3	2
New Zealand	2887.6	3796.5	5.6	69	86	4.5
Nicaragua	154.1	622.2	32.2	2.81	10.6	30.5
Niger	39.6	208.9	39.5	0.29	1.3	34.6
Nigeria	7948.2	46190.4	42.2	5.55	28.43	38.7
Norway	3854.1	4627.9	3.7	82.55	93.97	2.6
Oman	206.7	1935.4	56.4	8.3	68	52.3
Pakistan	10498.4	15907.1	8.7	6.5	9	6.7
Panama	571.6	1524.9	21.7	17.35	42.7	19.7
Papua New Guinea	109.6	140.3	5.1	1.75	2	2.7
Paraguay	478.4	1569.8	26.8	7.96	23.9	24.6
Peru	5768.3	10730.9	13.2	20.7	36.5	12
Philippines	5001	27507.1	40.6	5.74	29	38.3
Poland	17016.3	24848.4	7.9	44.58	64.88	7.8
Portugal	4020.6	5911.4	8	38.01	55.3	7.8
Qatar	283.5	1612	41.6	28.97	86.2	24.4
Romania	5352.5	9436.3	12	24.66	44.02	12.3
Russia	25865.2	69989.4	22	18.02	49	22.1
Rwanda	—	766	—	—	7	—

S. Tomé & Principe	22	34	9.1	14.18	20.16	7.3
Samoa	8.1	12.8	12.2	4.47	7	11.9
San Marino	15.4	15.7	0.4	50.21	49.6	-0.2
Saudi Arabia	4825.9	13339.2	22.5	19.46	47.5	19.5
Senegal	626.8	2234.3	28.9	5.61	17.5	25.5
Serbia	2203.5	3426.7	9.2	27.2	42.2	9.2
Seychelles	29.5	37.5	4.9	34.95	43.16	4.3
Sierra Leone	12.1	14.9	7.2	0.23	0.26	4.5
Singapore	2601.9	3890.9	8.4	59	75	4.9
Slovak Republic	3040.7	4073	6	56.08	74.44	5.8
Slovenia	1083.9	1465.2	6.2	54.01	72	5.9
Solomon Islands	8	33.1	33	1.65	6	29.5
Somalia	94	119.5	4.9	1.1	1.25	2.6
South Africa	3676.6	10596.6	23.6	7.61	21	22.5
South Sudan	—	—	—	—	—	—
Spain	22171.8	31403.5	7.2	50.37	67.6	6.1
Sri Lanka	509.1	3156.8	44	2.54	15	42.7
St. Kitts and Nevis	24.4	39.8	13	49	76	11.6
St. Lucia	40.9	73.9	12.6	24.5	42	11.4
St. Vincent and the Grenadines	13.1	47	29.2	12	43.01	29.1
Sudan	3185.7	8480.2	21.6	8.09	19	18.6
Suriname	48	169.4	28.7	9.5	32	27.5
Swaziland	41.3	218.2	39.5	3.7	18.13	37.4
Sweden	7978	8591.1	1.5	87.76	91	0.7
Switzerland	5653.5	6561.8	3	75.7	85.2	2.4
Syria	1482	4672.4	25.8	7.83	22.5	23.5
Tajikistan	246.1	909.1	29.9	3.77	13.03	28.1
Tanzania	2315.6	5546.2	19.1	5.8	12	15.7
TFYR Macedonia	584.7	1170.2	14.9	28.62	56.7	14.7
Thailand	11545.1	16475.9	7.4	17.16	23.7	6.7
Timor-Leste	1.2	10.4	53.7	0.12	0.9	50.5
Togo	110.6	215.4	14.3	2	3.5	11.8
Tonga	5.9	26.1	34.5	5.85	25	33.7
Trinidad & Tobago	396.2	743.2	13.4	30	55.2	13
Tunisia	1301	4142.3	26.1	12.99	39.1	24.7
Turkey	12597.2	31002.3	19.7	18.24	42.1	18.2
Turkmenistan	63.4	255.3	32.1	1.32	5	30.5
Tuvalu	—	3	—	—	30	—
Uganda	742.9	4490.9	43.3	2.53	13.01	38.8
Ukraine	2099.5	13828.2	45.8	4.51	30.6	46.7

United Arab Emirates	2424.6	5523.6	17.9	52	70	6.1
United Kingdom	41662.4	51182.3	4.2	68.82	82	3.6
United States	206493.4	243777.7	3.4	68.93	77.86	2.5
Uruguay	978.3	1737.3	12.2	29.4	51.4	11.8
Uzbekistan	1674.6	8383.6	38	6.39	30.2	36.4
Vanuatu	12.7	19.2	10.9	5.85	8	8.1
Vatican	—	—	—	—	—	—
Venezuela	4130.3	11839.5	23.4	15.22	40.22	21.4
Vietnam	14506.9	31139.4	16.5	17.25	35.07	15.2
Yemen	265.6	3696.4	69.3	1.25	14.9	64.2
Zambia	488.8	1549.6	26	4.16	11.5	22.6
Zimbabwe	1226.9	2002.4	10.3	9.79	15.7	9.9
Total	**1128716.4**	**2238124**	**14.7**	**17.3**	**32.3**	**10.7**

Source: ITU World Telecommunication/ICT Indicators 2012 database

Data from the Geddes, Wright, and Frantz (2012) study was included in order to gain a finer level of granularity in terms of autocracies. Given the broad categories presented in the rankings of Freedom House, the Geddes, Wright, and Frantz study allows a closer look at the relationship between access to information and the levels of democracy, or lack thereof, within those countries categorized as autocracies. In this case, an autocracy is a country where

> …any of the following occurred, and the same basic rules and leadership group persist in subsequent years:
>
> 1. An executive achieved power through undemocratic means and, with his inner circle, established new rules for choosing leaders and policies.
>
>   "Undemocratic" refers to any means besides direct, reasonably fair, competitive elections in which at least ten percent of the total population was eligible to vote; or an indirect election by a body, at least 60 percent of which

was elected in direct, reasonably fair, competitive elections; or constitutional succession to a democratically elected executive.

2. The start date is the date the executive achieved power. The government achieved power through democratic elections (as described above), but subsequently changed mal or informal rules, such that competition in subsequent elections was limited. The start date is the date of the rule change or action (e.g., the arrest of opposition politicians) that crossed the threshold from democracy to autocracy.
3. Competitive elections were held to choose the government, but the military prevented one or more parties that substantial numbers of citizens would be expected to vote for from competing and/or dictates policy choice in important policy areas. The start date is the date when these rules take effect, usually the first election in which popular parties are banned. (Geddes, Wright, & Frantz, 2012).

The use of a regression model will be the vehicle to test for a relationship between levels of freedom and access to online information. An ordinary least squares model was chosen in order to reduce introducing errors. The independent variables chosen were the freedom rankings from Freedom House, political rights and civil liberties, as well as gross domestic product, foreign direct investment and the data set built by Geddis, Wright, and Frantz. The dependent variable is the number of internet users per capita. The number of internet users was gathered from the International Telecommunications Union and population data was gathered from the United Nations.

The OLS model will return results indicating whether a statistically significant relationship exists between the independent and dependent variables. In addition, the model will indicate whether each individual independent variable is statistically significant in relation to the dependent variable.

The independent variable of democracy will be viewed against the dependent variable of the number of internet users per capita. The ordinary least squares model will return results indicating whether the model has a statistically significant relationship and if so, its strength in regards to the variables being tested. In addition, the model will indicate whether each variable, political rights, civil liberties, gross domestic product, foreign direct investment and the Geddis, Wright, and Frantz data have a statistically significant relationship to the number of internet users per capita. The following chapter will discuss those results and their significance to this study.

CHAPTER 4
RESULTS

The independent variables, Freedom House freedom rankings, GDP, FDI, and the Geddis, Wright Frantz data set, were entered into the statistical software package STATA as well as the dependent variable, number of internet users per capita. Results were returned and analyzed in regards to the relationships between the variables.

Stata returns the value of several indicators concerning the regression model. While many of these abbreviations will be described, this model primarily focuses on R^2, which indicates the strength of the relationship and how much of the dependent variable is explained by the model. In the results, SS stands for sum of squares, while df is the degrees of freedom present in the model. MS is the mean square, number of obs is the number of observations used by Stata in the final model, F is the F statistic, which is used to test whether the model is significant with no independent variable included. Prob > F describes the significance of the F statistic, Adj R-squared describes the explanatory strength that is provided when the independent variable is added, and Root MSE is the root mean square error, which also indicates how well our model fits our hypothesis.

Results of several indicators are returned by STATA. One indicator is the sum of squares which reflects the dispersion of the points of the data set. In terms of the regression model, the sum of squares is used to help determine the amount of deviance present in a model. The sum of squares is determined by squaring each deviation and then adding those deviation squares up. As the deviations from the mean get greater, the sum

of squares also increases. This increase reflects a greater distribution of the data points for each variable. In these results, the sum of squares was a high number, but still within the range of expected results. This indicates that the data points were scattered from the median scores for each variable, but still within acceptable ranges. Given the vast differences between countries, these results were not surprising.

Degrees of freedom are defined as the population size minus 1, or N-1. It is an important figure in determining variance which is defined as $s^2 = (\Sigma(X - M)^2)/(N-1)$. Variance is the average of the squared differences of the mean. The variance measures how far each data point is from the mean of the entire data set. With this data set, there were a total of 143 complete sets of data for the countries of the world, thus returning 142 degrees of freedom.

> The mean square error indicates how close a line fits the data points.
>
> For every data point, you take the distance vertically from the point to the corresponding y value on the curve fit (the error), and square the value. Then you add up all those values for all data points, and divide by the number of points minus two. The squaring is done so negative values do not cancel positive values. The smaller the Mean Squared Error, the closer the fit is to the data. The MSE has the units squared of whatever is plotted on the vertical axis. (*What Are Mean*, 2011)

The number of observations indicates the number of observations used by Stat in making the final calculations of the regression. While more data points may have been included, as is the case of this model, not all of the data sets included all of the countries.

Therefore, Stata reflects the fact that it was not able to use all of the observations for this model.

F is the F statistic, which is used to test whether the model is significant with no independent variable included. The F statistic is determined by the following formula: $F = (R^2/k)/\{(1-R^2)/[n-(k+1)]\}$. As shown by the equation, the F statistic is strongly influenced by the value of R^2. As the value of F increases, stronger evidence is indicated against H_0. In this case, H_0 is the hypothesis that there is no relationship between our dependent and independent variables.

Prob > F describes the significance of the F statistic. It is also known as the p-value. As the p-value decreases, stronger evidence is indicated against H_0. In this case, H_0 is the hypothesis that there is no relationship between our dependent and independent variables. Typically, the null hypothesis, H_0, is rejected if the p-value is less than 0.05 (*F Test Computation*, n.d.).

The root mean square error is an important number reflecting how well our model fits the reality of the data. It is derived by squaring the mean square error. The mean square error indicates how close a line fits the data points. The root mean square error is typically used as it is reported using the same units as the data itself. It reflects the size of the ordinary error in the model. However, while it reflects the models quality, there are no criteria to determine whether a specific root mean square error is good or bad. It is often used to compare models, as opposed to giving an indication of correctness.

The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was run using the results as well. These tests were built for the primary to specifically test regression models for heteroscedasticity in order to verify that the model follows the assumptions

needed for an OLS model to function properly. Heteroscedasticity can occur when there is a difference in subpopulation data. Given that the data used is secondary data, there was a chance that this differential occurred with the data. Therefore, additional tests were performed to verify that heteroscedasticity was not present. This test checks "the null hypothesis that the error variances are all equal versus the alternative that the error variances are a multiplicative function of one or more variables" (Williams, n.d.).

The results were:

Ho: Constant variance

Variables: fitted values of NetPerCap

chi2(1) = 0.05

Prob > chi2 = 0.8220

Our results indicate that heteroscedasticity is not present as Prob > chi2 is greater than 0.05. In this test, if Prob > chi2 is less than .0.05, then heteroscedasticity is present. Therefore, the model fits the OLS assumption that no heteroscedasticity is present within the model.

Table 4.1
Results from Regression model

Source	SS	df	MS		Number of obs =	143
Model	67756.814	5	13551.36		F(5, 137) =	36.76
Residual	50507.445	137	368.6675		Prob > F =	0
					R-squared =	0.5729
Total	118264.26	142	832.8469		Adj R-squared =	0.5573
					Root MSE =	19.201
NetPerCap	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PolRight	-1.34922	2.324904	-0.58	0.563	-5.94656	3.248118
CivilLib	-6.464103	2.731267	-2.37	0.019	-11.865	-1.06321
GWF	0.3161168	0.0485065	6.52	0	0.220199	0.412035
GDP	6.47E-07	1.54E-06	0.42	0.676	-2.41E-06	3.70E-06
FDI	0.0000147	0.0000749	0.2	0.845	-0.00013	0.000163
_cons	51.83662	4.36157	11.88	0	43.21191	60.46132

Some of the important figures from the results are:

R^2 = .05729

Prob>F = 0

P>|t| for CivilLib = .019

P>|t| for GWF = 0

The results from the regression model returned some surprising findings in terms of the interaction between the variables. The model returned a value for R^2 of 0.5729. The resulting R^2 indicates a fairly strong relationship between the definition of democracy used within this model and the number of Internet users per capita. The model used indicates that the model explains ~57% of the relationship between the number of people using the Internet per capita within a country and that countries level of democracy. The results indicate less strength than was expected. Results with a much stronger relationship were expected as the levels of freedom within a country are often reflected in access to information in general, including online information. The results indicate that additional variables have an impact on the number of internet users per capita.

In addition, the P>|t| for CivilLib was 0.019, indicating statistical significance between the variable CivilLib and the dependent variable of NetPerCap, whereas the PolRight variable was not statistically significant in regards to NetPerCap. These findings indicate that while the independent variable used were built around an operationalized model of democracy, the variable that had affected the number of internet users per capita was actually the level of civil liberties available within a country. The smaller the value

of P returned by the model, the greater the likelihood that a relationship does exist. This suggests that countries with greater levels of civil liberties will have greater levels of access to the internet. This relationship would indicate that civil liberties are much more important indicators in whether an individual has access to online resources. Whereas, political rights do not have a statistically significant impact whether an individual has access to online resources.

These results could be impacted by the methodology used by Freedom House to gather data. The results could also be impacted by where Freedom House included certain questions in their survey and in their findings. Questions such as whether there is free and open private discussions available or there is a free, independent media within the country as well as other forms of cultural expression (*Freedom in the World*, 2012, p. 35).

In addition, the $P>|t| = 0$ for the GWF data set. This also indicates statistical significance between the variable GWF and the dependent variable of NetPerCap. This result indicates that the rankings developed by Geddis, Wright, and Frantz to score autocracies does impact the number of internet users per capita within a country.

While some outliers or influential data points are expected, the test determines whether they have any significant effect on the model. By removing data points, it is often easy to allow additional errors to enter the model due to the removal of those points. Therefore, whenever possible, a complete set of data points should be included in the regression model. However, if they introduce undue amounts of error into the model, the parsimony of the model may be better served by removing those influences.

A robust regression was run in order to verify the results from the previous regression model. The robust regression command estimates the standard error using the Huber-White sandwich estimators. The Huber-White sandwich estimators are "used to estimate the variance of the MLE when the underlying model is incorrect. If the model is nearly correct, so are the usual standard errors, and robustification is unlikely to help much" (Freedman, 2006).

At times, outliers or other highly influential observations may be present in the data. While it is possible to run additional tests to beginning determining whether this is the case, a robust regression can quickly and easily determine if such factors exist within a model. If so, additional testing can be done in order to locate any outliers present or to locate any data that have significant influence on the model. The findings below indicate the results of the robust regression model, using the same variables as the previous normal regression model.

Table 4.2
Results of the linear regression

Linear regression				Number of obs =	143
				F(5, 137) =	60.73
				Prob > F =	0
				R-squared =	0.5729
				Root MSE =	19.201

NetPerCap	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
PolRight	-1.34922	2.4749	-0.55	0.587	-6.24316	3.544724
CivilLib	-6.4641	2.891247	-2.24	0.027	-12.1813	-0.74686
GWF	0.316117	0.052014	6.08	0	0.213263	0.418971
GDP	6.47E-07	1.32E-06	0.49	0.625	-1.97E-06	3.26E-06
FDI	1.47E-05	4.18E-05	0.35	0.725	-6.79E-05	9.73E-05
_cons	51.83662	4.792355	10.82	0	42.36006	61.31317

The robust regression also returned a R^2 value of .5729, exactly the same as our previous model. Therefore, our previous regression test was shown to be relatively free of an errors based upon the Huber-White estimators. In addition, while there are some differences between the t values and the P values, the differences are minor. This indicates that any problems in the data not significant enough to invalidate the findings.

These findings show that the hypothesis is statistical significant. Therefore, as levels of freedom increases, levels of access to the internet increase. Specifically, based upon these findings, as civil liberties increase, levels of access to the internet increase. This would indicate that the important component of the Freedom House freedom rankings that has the most statistically significant impact on the number of internet users is the level of civil liberties within a country.

In addition, the results from the Huber-White sandwich estimators indicate that no outliers or other highly influential observations are present in the data. These results indicate that our model follows the assumptions needed for correct results from an ordinary least squares model.

Often times, political rights would seem to be the leading variable that would impact number of internet users. Political rights include activities such as participation in the administration of a government and power or privilege possessed by an individual (*Political Rights,* n.d.). The freedom to access information in whatever form would seem to be included as a political right enforced by the government.

However, the model indicates that civil liberties, which often includes such topics as freedom of speech and freedom of assembly, has a statistically significant relationship to the number of internet users. These findings indicate that as a country expands its civil

liberties, such as greater freedom of actions, access to the internet is also expanded. This would indicate that as the world grows more interconnected and the digital world and physical world overlap, such ideas as freedom of action would include not only physical actions but virtual ones as well. An individual would be free to access not only physical materials but virtual ones as well.

The variable for the gross domestic product of a country returned values that were not statistically significant. Cost has been discussed as a barrier to access to the internet. While this may be true at the individual level, the GDP of a country, which would indicate greater levels of disposable income, did not have a statistically significant impact on the number of internet users. Therefore, individuals in a country with a higher GDP did not have a statistically significant advantage over those individuals in a country with a lower GDP.

In addition, foreign direct investment returned values that were not statistically significant. While some research, as discussed by Graham & Spaulding, indicated that FDI increases technology adoption, that adoption did not translate into a statistically significant impact on the number of internet users. This contrasts the definition of the digital divide as the definition includes access to technology (Cullen, 2003).

The Geddis, Wright and Frantz data set did return values that were statistically significant. However, the GWF data includes the scores for both political rights and civil liberties from Freedom House. Based upon the findings about civil liberties, these results were in alignment with the results from civil liberties.

These findings indicate that civil liberties are ultimately the best indicator for the number of internet users although previous research indicated that many of the other

variables should have had statistically significant results as well. GDP, FDI, and political rights, while important factors in freedom, did not have a statistically significant impact on the number of internet users per capita.

Discussion

Based upon these findings, the operationalized definition of democracy explains a majority of the relationship between levels of democracy and access to the Internet. The implications are important in terms of long-term policy decisions and investment opportunities.

In terms of bridging the digital divide, the more that is known concerning the variables that impact the divide, the better informed a decision can be in terms of where investments should be made. While some variables are soft and can be overcome, such as a lack of electricity, other variables are hard and cannot be influenced, in this case, the level of democracy within a country. By reviewing each variable and the strength of its relationship to the digital divide, better policy making decisions can be made. "Fear of scaring foreign investors away led the government of Malaysia to end restrictions, including monitoring Internet activity for messages considered a threat to national security and requiring cybercafés to register with the government" (Guillén & Suárez, 2005, p. 688).

Some variables are often enough to stop a project from leaving the drawing board. Such hard variables can include democracy, physical access to an area, and government control. By discussing and analyzing the strength that each variable has in terms of levels of access, a funding agency could decide to fund one project over another in order to gain a greater impact in bridging the digital divide. Educational Testing Service stated that

“Governments, education experts, and researchers should conduct new public policy research with the data derived from these assessments. This information can help policy makers, educators and industry as they attempt to broaden people’s access to and fluency with new technologies. Government investments, education curricula, and philanthropy should all be influenced by the data derived from these assessments“("D. Summary of Recommendations," 2007).

This study found that civil liberties have a statistically significant impact on the number of internet users. Therefore, as policy makers review where to make changes in order to increase the number of internet users within their country in order to reap some of the benefits available, their policy changes should focus on increasing the civil liberties of their country rather than affecting other changes, such as trying to increase the FDI coming into their country.

In today’s society, investors and funding sources are often focused on quantitative results from the use of their resources. By discovering which variables have the greatest impact on the digital divide, then separating those variables into groups that can be affected and those that cannot, entities and organizations that begin to tackle the digital divide can make better-informed decisions.

Those groups that receive access to technology and online resources will certainly benefit from that access. Telemedicine has had a significant impact in rural Africa, where even basic healthcare was often unavailable. By introducing access to medical professionals, these communities have the ability to consult with some of the leading experts in the world, without either party needing to leave their respective areas. “The benefit is magnified in smaller communities. Britton described a situation where a

pediatrician might diagnose a heart murmur in a child, but when a pediatric cardiologist is brought in via telemedicine, they discover it was a false alarm" (Alphonse, 2013).

As more people get connected to the multitude of resources available online, they are adding their own unique perspectives and experiences to the overall discussion, thus providing greater levels of richness and depth to a conversation that is already breaking down social and cultural barriers that have been in place for decades. Groups can use those resources to assist people in building their own information resources and add often unique ideas and concepts that may have previously gone overlooked. Groups can also use the information available as a basis for building knowledge and then returning it back into the cycle. This ever-expanding pool of knowledge then helps other groups in ongoing research and development, ultimately benefitting their local community, nation, and the world.

This study found that as civil liberties increase, the number of internet users increases. Therefore, one method that could be introduced to bridge the digital divide would be a move away from simple technology access and a shift towards increasing the civil liberties within a country. By advocating for more liberties, such as increased freedom of speech or freedoms of expression, policy makers would also be advocating for a narrowing of the digital divide.

Limitations

While the model does show statistical significance based upon our regression model, there are still a number of limitations associated with the model and the data. While none of these limitations are significant in and of themselves, accuracy requires a discussion about any possible issues.

The use of regression models has been an established method of research for a number of years. As computational methods were polished and perfected, reliance on regression methodology increased in quantitative studies. However, these studies are not 100% accurate. There is a chance, albeit small, that the findings are erroneous. In quantitative methodology, two main errors can typically occur: Type I and Type II. In the case of a Type I error, the null hypothesis, H_0, is in reality true. However, it is rejected due to a value of $P \leq 0.05$. In the case of a Type II error, the null hypothesis, H_0, is false but is accepted because of a value of $P > 0.05$ (Agresti & Finlay, 2009, p. 159).

One reason for the introduction of this error is that the value of α should equal 0.05. This indicates that there is a 95% chance of the model reflecting what is occurring in the data. A slim chance of 5% still exists that the findings returned from the regression model are unique and do not reflect the reality of the situation according to the data. When this occurs, the model will return findings that are the opposite of the reality represented by the data.

Type I and Type II errors have a correlation. As the value of P for Type I errors decreases, the value of P for Type II errors increases (Agresti & Finlay, 2009, p. 161). Therefore, researchers must strike a balance between these two values in order to offset Type I errors against Type II errors.

The true effects of a relationship may be less significant than what is reported by the regression model due to a number of factors, such as outliers being included in the model to gain a greater understanding of the broader picture, yet they are so distant from other data points that they impact the mean significantly. Some combination of factors could exert greater levels of influence on the model that are not true representations of

the reality represented by the data (Agresti & Finlay, 2009, p. 165). While the model is a best fit based upon the data being used, it is still only a best fit; it is not necessarily a perfect fit or a reflection of exactly how the data looks.

While a number of safeguards are in place to reduce the risk of obtaining a Type I or Type II error, there is still no method that returns a result that has no chance at being incorrect. However, based upon the tests run on the model, it is unlikely that either of these types of errors occurred.

The data obtained is secondary data, that, even when obtained from highly reputable sources such as those used in this study, can have errors that may not be noticeable to other users. While human error is certainly possible, translation errors can also be involved that could affect the results of the model. To evaluate the usefulness of secondary sources, researchers must review several factors, including the purpose the data was originally intended, scope of the data, authority of the body that gathered the data, and audience that the information is based on (Cooper & Schindler, 2006, Ch. 7).

In terms of the data used in this study, each of these factors will be discussed. The purpose of the data is the same as the original use for which the data was gathered. In this case, the data used for the GDP variable was specifically GDP data gathered by the World Bank. The data containing the number of Internet users in a country was gathered by the International Telecommunications Union specifically in response to requests to review how many Internet users are in a given country. The data for the FDI was gathered based upon FDI findings by the World Bank. The data set from Freedom House was built specifically to measure the levels of democracy within a country. Finally, the

Geddis, Wright, and Frantz data set was designed specifically to give greater levels of granularity for levels of freedom with autocratic countries.

The scope of the data sets used was all inclusive. In the model used, a global perspective was the primary focus, and thus global data was used. The data sets were included based upon their global perspectives and scopes. By using a global viewpoint, the data sets fit the same context and scope for which they were initially designed. Therefore, no additional errors should have occurred.

The authority of the body that gathered the data was of paramount concern in building our model. Therefore, only data that was obtained directly from globally recognized sources was used. Each data set was obtained directly from the websites or databases of each of the respective entities and not from outside sites that were mirroring the data or storing it on their servers. Only NGOs were reviewed. While some level of bias is expected in the data, by using NGOs, it was hoped that the amount of bias included was at a minimum. The NGOs in this case were world renown and often worked with local, national, and other international parties in their data collection.

Finally, the audience that the information is based on was reviewed. With regard to the data sets used, the audience for which these data sets were built was primarily researchers. The data sets were included in formats that were easily built into tables and models with few adjustments made to the core data. While some labels and abbreviations had to be standardized, such as how country names were displayed, in general, the data sets were presented in such a manner as to encourage their use by researchers. This was a significant concern while gathering data in that the data was built for research and not as propaganda devices or methods to show the superiority of one group over another.

Human error could always be a source of unexpected errors. While multiple reviews of the data were performed, there is a slight chance that a transcription error occurred. Due diligence was given when data was copied from one data set to another or from one program to another. However, some human error could be present within the data that was not detected.

While every effort was made to reduce the amount of errors introduced into the model, a chance of error in the model remains. As all of the data was secondary data, the author was unable to verify the original data used to compile the data set. While the integrity and reputation of the organizations from which the data sets were obtained are world renown, there is still a slight chance that an error was introduced into the data set prior to their compilation and introduction into the database.

CHAPTER 5

CONCLUSION

The initial discussion on the digital divide was an important step in acknowledging this form of exclusion. As technology continues to grow and expand, the adoption of newer technologies is inevitable due to their increased levels of efficiency and lower cost. However, much of the discussion concerning the digital divide does not keep pace with the new technologies, as much of the research initially focused on technology access to the point of excluding any other variables. Brown, Barram, and Irving began the discussion concerning the digital divide in 1995, and this discussion continued through the end of the 1990's, whereas technology continued to expand and connection speeds increased. This mindset of focusing only on technology access actually hindered the discussion as many people viewed access to computers as a venue for games, adult content, and social media rather than as a method to access the plethora of valuable online information.

The analysis of which variables impact the digital divide is a key factor needed to bridge the divide and integrate many marginalized groups into the information society. As researchers discovered and analyzed the divide, the three primary variables were discovered: human capital, infrastructure, and skills. As the discussion expanded concerning infrastructure, or the lack thereof, policy makers began to take note that this was not a simple problem of someone having access to a computer with a modem. Instead, this was a problem of education, resources, skill sets, and access to physical

assets. “Internet-savvy students describe dozens of different education-related uses of the Internet. Virtually all use the Internet to do research to help them write papers or complete class work or homework assignments” (Levin & Arafeh, 2002, p. ii). “Information about people's online skills tells us to what extent they are able to use the medium in ways of most interest to them and in ways that are most useful to their particular needs. The ability to find different types of information online allows people to use the medium to their maximum benefit” (Hargittai, 2002).

For variables that cannot be influenced by outside forces, organizations that are trying to bridge the divide should be aware of the strength of the relationship between the variable and Internet access to determine whether it is viable to invest the time and resources into an area where such access may not have any significant impact. This type of variable that cannot be easily influenced by outside forces was the primary focus for this research. In this case, an operational definition for democracy was determined that stated that democracy was composed of a number of variables—economic, governmental, and social—that were encompassed by several data sets.

The basis of this definition was the rankings based upon the Freedom House data that was obtained directly from the Freedom House, which is an acknowledged leader in gathering data and ranking countries on their levels of democracy. These rankings are based upon two primary categories—political rights and civil liberties—within a country. Both of these categories were included in the model as independent variables and ranked between 1 and 7, with a country ranked 7 having the least freedom and a country ranked 1 having the most freedom.

Geddis, Wright and Frantz (2012) took these findings one step further and added greater levels of granularity to countries that were considered autocracies (i.e., countries with high rankings on the Freedom House scale). While the rankings were fair, there were still significant differences in higher-ranked countries. By including the Geddis, Wright, and Frantz data, it was expected that greater degrees of granularity would be included in the regression model. "Scholars can use the data to disaggregate the transitions we identify by different characteristics (e.g., violent/non-violent, transitions via election vs. coerced transitions, domestic-led/foreign led), enabling them to test hypotheses about whether these characteristics lead to different outcomes" (Geddes, Wright, & Frantz, 2012). In this regression model, the different outcome hypothesized was whether autocracies had lower levels of Internet access than countries with greater levels of democracy.

Many variables are known to impact the digital divide. As these variables are categorized between variables that can be easily affected by outside forces and those that cannot be affected, policy makers can then determine the best course of action needed to have the greatest impact on the digital divide. With hard variables, these factors are outside the ability of most organizations to change, and therefore need to be accounted for prior to investing resources into an area. While the soft variables may add additional financial burdens, they are ultimately factors that can be overcome appropriate planning and resources must be considered.

Investors want to see the greatest return from their resources. By tracking which variables explain the most about their relationship with the number of Internet users, and then analyzing which can be overcome and which cannot be, organizations can better

estimate the return on investment being made in a given community and plan their investment strategy accordingly.

Groups that are in need of online resources can also determine which variables they may be able to assist with, thus making their communities more competitive in terms of resources investment. For example, a community may begin to incorporate greater technology skills into their education programs to build greater levels of human capital. They may also approach other local communities and build communal resources, such as a shared community center, that could house computers and allow greater numbers of people access to technology. This is shown in Indian libraries as a "group of participating libraries take the initiative to co-ordinate their acquisitions. Their objective is to eliminate duplication in acquisitions to the 14 extent it is possible. Further, the member libraries undertake to give services such as information access and document delivery.… This model is in operation in most of the resource sharing programmes started by various library networks such as Delhi Library Network(DELNET), Bombay Library Networking(BONET),Madras Library Network(MALIBNET) and Information Library Networking(INFLIBNET)" (Kaul, 2001, p. 12).

All things being equal, a difference in levels of freedom could sway policy makers to develop different policies and procedures to help countries with technology and Internet access based upon that difference. By separating variables that impact the digital divide into hard or soft, policy makers can make better-informed decisions as to where investments should be made to have the greatest impact in bridging the divide. In today's society, investors and funding sources are often focused on quantitative results from the use of their resources. By discovering which variables have the greatest impact

on the digital divide, then separating those variables into groups that can be affected and those that cannot, entities and organizations that begin to tackle the digital divide can make better-informed decisions and return to their funding partners concrete estimates of the impact the investments have made.

Only by examining the digital divide at finer levels of granularity will specific solutions be found. This study found that by increasing levels of civil liberties, the number of internet users also increases. However, the economic variables included in the model, GDP and FDI did not have a statistically significant relationship. Therefore, working to increase GDP and FDI will not necessarily narrow the digital divide. In addition, political rights did not have a statistically significant relationship with the number of internet users per capita. As political rights increase, the digital divide will still not narrow based upon the findings of this model.

By dissecting the divide at the local level, examining what variables are affecting the community, such as access to infrastructure, literacy rates, or even levels of electricity available within a community, and then reviewing which of those variables has a significant relationship with the divide can a long-term solution be found. While many short-term solutions have been proposed over the years, such as the $100 laptop program, they have slowed the rate at which many groups are falling behind, not actually helped them to catch back up and bring them to an equal footing. In the case of the $100 laptop, these machines are either using older technologies or the systems are not upgradable, thus leaving the groups behind within a few years once again.

Only by recognizing the significance of the digital divide will the importance of a solution be brought to the forefront of policy. By dissecting the divide, determining the

effects of variables on the digital divide and determining which of those variables have the greatest impact on the digital divide can we find a long-term solution. This study, while not a definitive answer to the divide, is one step towards a solution.

Future Studies

The results of this study indicate that there is a positive relationship between democracy, as defined within this study, and access to the internet. However, several additional questions were raised by these results.

While the GWF data resulted in a statistical significant value, the results of the civil liberties value returned a value that was statistically significant. However, the values for political rights, GDP and FDI did not return values that were statistically significant. Further studies into the results of the Freedom House ranking could be done to tease out the variables within the civil liberties category that have the greatest impact on internet users. The questions used to build the civil liberties ranking are numerous and therefore present a strong data set to be used in further regression models.

In addition, other data sets that measure freedom, such as those from Polity IV, could be used in place of the Freedom House data set. While the findings should be similar, Polity IV uses their own surveys in order to gather data. In addition, Polity IV uses a different scale for freedom. The scale at Polity IV ranges from -10 to 10. This finer granularity could produce different results than those discovered from the Freedom House data.

Furthermore, the advent of mobile technologies has made an impact of the methods used to access the internet. Future research could look at the impact that these newer technologies have had on access to the internet. As new ways are made available

to gain access to the internet, has the number of internet users increased or have these new technologies simply replaced older ones with no net gains in access?

Additionally, the results on the economic indicators, GDP and FDI, indicated no statistically significant relationship to the number of internet users. However, previous research found that lower socio-economic status did have an impact on access to the internet. Research into why these broader economic indicators are not statistically significant could present interesting findings.

Cost has often been discussed as a barrier to entry for internet use. However, if an increased GDP does not have a statistically significant relationship with number of internet users, it would seem that there is a disparity between these two findings. Therefore, different economic indicators could be introduced into the model, replacing GDP. Given the large disparity in wealth dispersion within many countries, the GDP may be masking the results at the individual level.

According to Graham & Spaulding (2004), FDI increases technology adoption. However, this model found that FDI did not have a statistically significant relationship to the number of internet users. As technology increases, the digital divide decreases based up on the definition by Cullen (2003). This opens up a greater discussion as to why this seeming disparity in research is happening. Is the increased technology adoption implemented by FDI being used simply to replace aging infrastructure already in place? Is the technology being implemented in areas that already have a significant penetration rate of technology, therefore very little net gains are seen in relation to the number of internet users per capita?

The study done by Graham & Spaulding (2004) is over a decade old. A new study replicating their work could also be done in order to review whether their findings still hold true. In addition, the variables they used in their study could be reviewed in order to find statistically significant results for each variable.

While this study returns interesting results based upon the statistically significant relationship between civil liberties and number of internet users, it also yielded more questions than the initial research question. The lack of relationship between the most of the initial variables as well as the seeming incongruity between these findings and the research reviewed points at several questions that need to be answered in order to continue discovering ways to narrow the digital divide.

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