Reconsidering the Digital Divide:

A Look at Technology Innovation in Developing Countries

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In the academic realm, the term digital divide which typically relates to the gap between those who have and do not have access to information and communication technologies (ICTs), has been an attractive subject on the scholarly and political agenda. The problem however is that the topic is highly fragmented in academic literature, and many of the research findings are inconsistent and contradictory. In addition, too much of the research effort has gone into the 'niceties' of measuring the divide and too little has been devoted to establishing a consistent analytical framework. In information systems and development terms, there have been few attempts to critically pinpoint the socio-economic impact of ICT innovation in developing nations and its relation with bridging the digital divide. The goal of this literature review accordingly, is to demonstrate how theoretical perspectives regarding ICT innovation can strengthen digital divide research within the broader socio-economic context of developing nations. The paper simultaneously calls for more extensive empirical studies backed by theory and valid operational frameworks.

Keywords: digital divide; access to ICT; digital divide measurement; innovation; social exclusion; diffusion of innovation theory; IS theory; ICT and development

1. Introduction

There has been a lot of interest generated on the digital divide judging by the vast amount of scholarly work that has been produced since the mid 1990s. The topic has been (and still is) a central of national and international debates as they propose to tackle the growing issue of inequality in the society. The main problem however arises in the lack of definition and conceptual explanation of the term the digital divide, thus resulting in more confusion than clarification.

The ambitious purpose of this paper is to review and analyse the relevant literature on some key aspects of the digital divide. In the next section, I begin with a discussion on some of the scholars' different approaches and contributions in interpreting the digital divide, seeing how the focus of research has evolved over time. In highlighting the obvious variations of the different definitions, I then examine the different conceptual frameworks and models used in measuring the digital divide, in order to pinpoint whether they in fact attempt to identify the real issue. In the following section, I focus on one research theme, specifically the role of ICT innovation in developing nations and its impact on growth and poverty. Finally, I conclude with a recap on the different perspectives focusing on the aspect of diffusion of technology in developing countries, with some suggestion for future research and policymaking.

2. Understanding the Digital Divide

> *"The 'digital divide' is one of the most discussed social phenomenon of our era. It is also one of the most unclear and confusing" (Warschauer, 2003)*

The term 'digital divide' first appeared officially in the United States and according to Gunkel (2003), was a result of a US Internet access study by the National Telecommunication and Information Administration (NTIA) that revealed sharp disparities among users according to race, gender and income (Vehofar et al., 2006). More and more of the term began to surface in various political speeches, policy analysis and conferences triggering an immense amount of investigation in the scholarly literature.

Numerous schools of thought have emerged on the interpretation of the digital divide as researchers try to find answers to many critical questions such as: What inequality does the digital divide refer to? Who gains and loses from bridging the digital divide? What future course will the digital divide take?

However, the current state of debate is such that answers to these questions are divided up into 4 different categories. The first group sees the divide as a 'non-issue' (Compaine, 2001). The second group sees the divide as a 'real issue' and particularly an economic one tied to the problems of development (Antonelli, 2003). The third group sees the issue as a more political and social one (Hacker and Mason, 2003; Colby 2001). Finally, the fourth group reject any ideas that sees the digital divide as a strategic, political or development one (Alden, 2003). That last group also recognizes that all efforts put to bridging the digital divide seem to benefit the rich sections of society more then they do the poor (Yu, 2006).

Despite all these efforts, Digital divide research is short of theoretical analysis and conceptual framework (Vehofar et al., 2006). In the next section, I will present how the many interpretations of the digital divide evolved over the years.

3. Conceptualizing the Digital Divide

Earlier study of the digital divide was built primarily upon the principle of "haves and have-nots" of access to ICTs (Bertot, 2003), and to *"the attached importance of the physical availability of computers and connectivity rather than to issues of content, language, education, literacy, or community and social resources*" (Warschauer, 2003).

This view was misleading because it attempted to rationalize the postulated relationship that exists between IT and the social context. Both Van Dijk (2003) and Gunkel (2003) refute this idea and warn that this view resonates some form of technological determinism. The idea that 'physical access' to computers and networks would solve particular problems in

zboth the economy and society not only suggests a technological bias, but also a normative one.

Looking at it from a political standpoint, Bertot (2003) argues that this view of the divide, as being a gap of technology "haves" and have-nots", becomes extremely problematic as it enables politicians to cut funding to various technological initiatives intended to bridging the digital divide gap in certain communities.

Nevertheless, research has evolved and the focus has shifted from a simplistic view based on 'dichotomous measures' to a more complex view, deeply rooted within the social and economic structures. Researchers like Warschauer (in Vehofar et al., 2006) express their view of a "simple binary divide" as inaccurate since it fails to value the social resources of diverse groups.

In dealing with the expression of 'access', many researchers have suggested to reframe from the 'techno-rational' ways of thinking and to a more social, psychological and cultural view of perception. For example, Van Dijk and Hacker (2003) encompass a more 'multifaceted' meaning behind the term 'access' to ICT by stretching beyond *"simply having a computer and a network connection"* but by pointing out the disparity of access along the elements of 'motivational access, material access, skills and usage'. Fig.1 shows how Van Dijk uses a recursive and cumulative model in his research to extend the concept of 'access' and accordingly, uses this model as a framework to interpret the digital divide. In another study, Hargittai (2002) similarly identifies the importance of skills and experience to the divide as the main problem once the Internet becomes universally accessible.

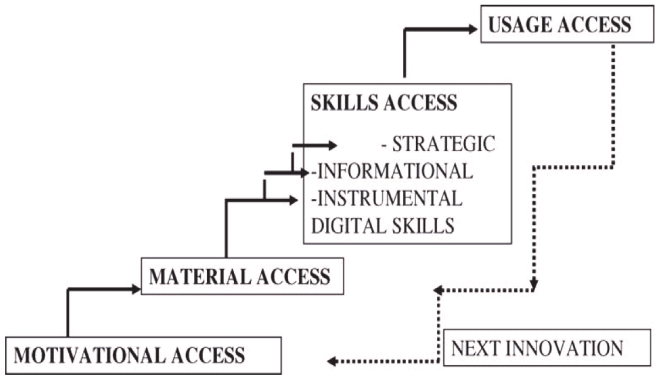

Figure 1: A cumulative and recursive model of successive kinds of access to digital technologies. Source: Van Dijk (2005), p.22

3.1 Measuring the Digital Divide

Moreover, there are a number of empirical studies which survey the scale of existing digital divides between countries and between societal sections within a country. In one study, Norris (2001) surveys 179 countries across the world to observe the degree of access and use of the Internet, and produces her own interpretation of the divide that is classified into 3 categories: the global divide, the social divide and the democratic divide. The research Norris (2001) conducts is more normative than descriptive seeing as she tries to uncover the digital divide by providing researchers better prescriptions to more policy initiative.

Other scholars have conducted their research in a more accurate and quantitative manner. Researchers like Corrocher and Ordanini (2002) examine case studies in various countries by using indicators from the NTIA (US) reports and OECD statistics. Another such study is that of Chinn and Fairlie (2004). They attempt to explain the digital divide by conducting a cross-country analysis to precisely estimate the role played by various variables such as income, infrastructure indicators, telecommunication pricing measures and regulatory quality.

There are more efforts of similar cross-country studies performed on the digital divide, and they all produce a vast amount of correlation. Most of them agree that disparities do in fact exist in the use and access of ICTs between countries and between sections of society within a country. However, many of the investigations disagree on the size and magnitude of such divides. The fact that these studies often adopt different definitions and indicators of the divide makes the comparison between different research findings even more difficult. Vehofar et al. (2006) for example, identifies three different approaches to digital divide measurements: multivariate modeling, compound indices and time-distance methodology. They argue that the inclusion of 'theory-driven' variables and proper modeling are the key elements for successful empirical research (Vehofar et al., 2006).

Simply put, there are many different interpretations and studies of the digital divide that can be found in shelves of articles and books. However, many of these studies have remained of a descriptive and normative nature. Few have attempted to critically pinpoint the main issue that influences one's view of the importance of the digital divide, and in explaining the significant consequences of these gaps, especially against theoretical background based on Information Systems (IS) and Development literature. In this next section, I will discuss how various scholars view the decisive role ICT plays in the digital divide, with particular focus on the aspects of the diffusion of ICTs in developing nations and the changes innovation brings in the wider socio-economic context.

4. Diffusion of ICTs in Developing Countries

What puzzles the minds of many researchers is the question of whether there are tangible benefits to using ICT that address the social, cultural and political dynamics in developing countries. There are numerous studies in the IS literature that identifies the many opportunities ICT provides in improving a country's productivity and efficiency and more generally, raising well-being of its members. In Castells' view, information has become an independent source of productivity and power (Castells, 2000). He argues that we are now living in a 'new economy' where competitiveness and productivity are measured by the capacity to generate knowledge and process information rapidly (Castells in Mason and Hacker, 2003). Similarly, Van Dijk (1999) argues that ICT innovation strengthens the societal influence and power of those with the most resources. Furthermore, there is substantial evidence in the IS literature that shows how individuals and organizations in the developed countries are enjoying the benefits of these interactive communication technologies.

4.1 Social Exclusion

This makes the digital divide a real issue. According to Van Dijk (2005), the divide adds to the relative disparity in society that is already imbalanced in terms of 'old' types of resources and materials. Therefore, this results in a negative outcome such that those in the developing (and even within communities in developed nations) to be excluded from the emerging forms of technologies and innovation.

Many scholars have talked about the threat of 'social exclu-

sion', and many produced an abundance of work and theories. Tranter and Willis (2002) warns that new 'status divisions' between those included and those excluded from access to ICTs may emerge when certain members of society benefits from ICTs to improve their life situations, while other members of society do not. Mason and Hacker (2003) apply the Structuration theory to recognize the 'social exclusion' issue of the digital divide. Similar concerns are echoed by Castells (2000) in his argument about "network society". Both share a common understanding of the importance of ICTs as an instrument of influential networking, organizing and making institutional changes (Mason and Hacker, 2003).

4.2 Applying Diffusion of Innovation Theory

This leads to the next question: What are the impacts of ICT innovation on the digital divide? In an attempt to provide a useful guide in understanding the implications of ICT innovation on the digital divide, Mason and Hacker (2003) draws elements from the Diffusion of Innovation Theory namely the 'S-curve' and the 'trickle-down principle', in order to emphasize the importance of critical mass in the adoption of new media and technologies. In response to Compaine (2001), who was one of the scholars who stated that the digital divide will eventually disappear because of the nature of the market place, Mason and Hacker (2003) argue that ICTs, follows S-curves where early adopters who have the most personal resources first adopt the technology and the others follow suit over numerous years.

Yet, many scholars criticize the use of the innovation theory in the notion of the digital divide. Van Dijk (2005) considers the theory undesirable because it bears somewhat of a deterministic flavor. In his view, adopting the innovations theory in the digital divide ignores the dynamic nature of both the society and the economy. The 'trickle-down' principle for example, states that the Internet and personal computers will soon be available to all because these technologies are getting cheaper and easier to access. However, this principle ignores the fact that society is also a dynamic entity that is constantly changing by the very way they are structured.

Norris (2001) on the other hand, attempts to take up the idea of Diffusion of Innovation theory and elaborate it further using both the normalization, and stratification models. The normalization model suggests that the divide gap will narrow in the last stages of diffusion as technologies become cheaper and easily accessible. Whereas the stratification model indicates that the gap will continue because people who have first adopted the new technologies will not stop obtaining new ones. Thus Norris' model leads to two different projections of the digital divide as shown in Figure 2 below.

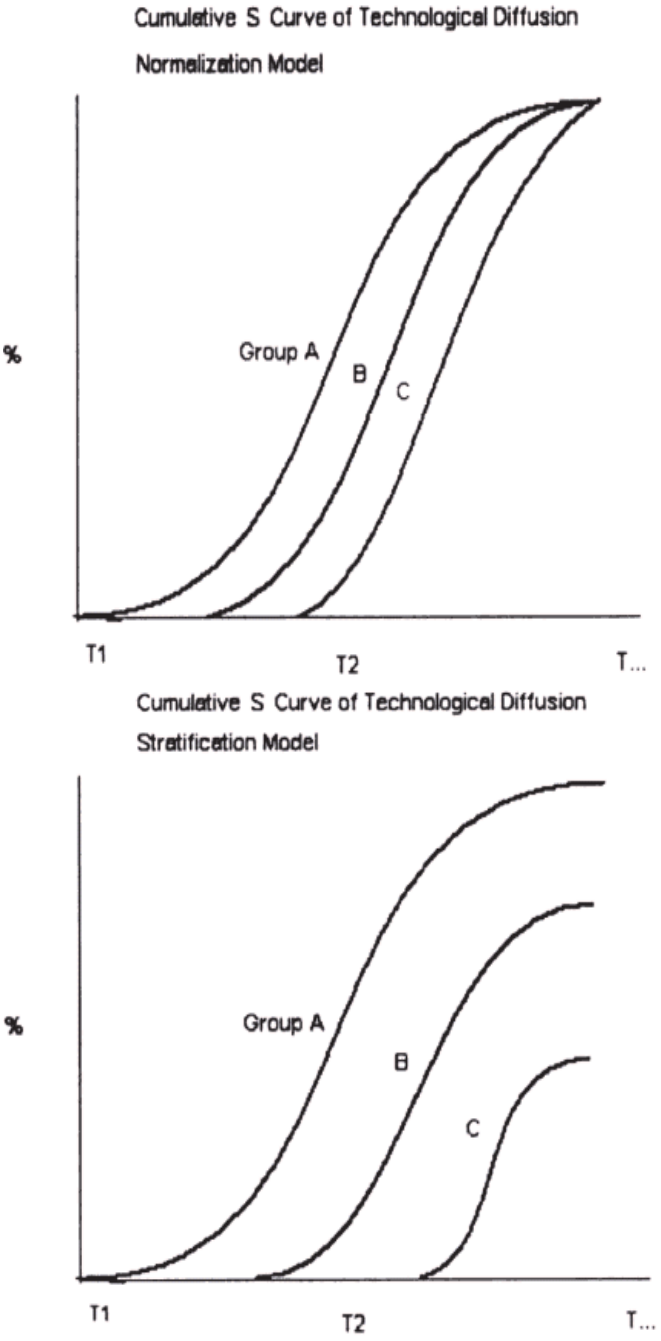

Figure 2: The Cumulative S Curve of Technological Diffusion

5. Impact of ICTs on the Digital Divide

The primary concern in today's debates when analyzing the diffusion of ICT in developed and developing countries is not so much on the socio-technical economic differences between the countries, and how factors such as income and infrastructure play a role in ICT penetration. The concern for most researchers is of the rapid change that has been occurring in the Digital Divide (James, 2007).

Recent data from the International Telecommunication Union (ITU) shows that Internet subscribers and mobile phone users have increased considerably over the past 10 years in developing countries (ITU, 2006). However, one's view of how important this change is on the digital divide gap tends to be heavily influenced on whether the concept is measured in relative or absolute terms (James, 2007). This implies that data can be pictured in an optimistic way, if measurements are based on the rate of growth of technology in developing countries; or in a more pessimistic way if measurements are based on the growing division of ICT stocks between developed and developing nations. According to Fink and Kenny (2002), the digital divide of ICTs is no more different than the other earlier divides of technologies such as the telephone, television and radios. In their view, the focus must be on the rapidity of which the gap is closing, and not on the size of the gap itself. Mason and Hacker (2003) argue that IT requires user capabilities that are hardly comparable to radio or TV, and only a minority of people in developing countries possesses these capabilities.

James (2007) on the other hand, believes that the global digital divide is just another reflection of the "technological dualism" principle, which was first introduced by Singer (1970). The "technological dualism" principle recognizes the fact that

technological gaps between countries existed since the industrial age, because innovation had always been concentrated in countries that would closely resemble the socio-economic characteristics of developed countries (or urban sectors within a country with high income and education). James (2007) then goes on to use this principle to acknowledge that the pattern of diffusion of ICT would closely resemble what the idea of 'technological dualism' would tend to predict and that this outcome would then favor the rich countries.

6. Conclusion

Attempts to measure the impacts of diffusion of ICT in developing countries have been limited. Some argue that ICT contributions to economic growth have mostly been focused in developed countries. There is remarkably little reliable evidence in literature today that displays the full potential of ICTs in developing countries from a social and economic perspective, as most research has been focused on developed countries. Several multinational firms and institutions have occasionally shown interest in investing in ICT-related projects for the poorest groups in developing countries. This is encouraging from a policy perspective according to James (2006), as innovation represents in his view, the most promising change in bridging the digital divide. From this point of view, the challenges of bridging the digital divide thus lies in finding alternative ICTs and institutions that better meet the need of the people in developing countries.

There are of course several key aspects of the debate that could not be discussed here due to the voluminous nature of the topic. However, some of the key research designs and methods have been examined in this review that is not exhaustive, nor definitive, but merely brings out the major points relevant to the IS literature. It is evident that there is a clear lack of conceptual elaboration and definition in current digital divide research and filling that gap is the most urgent of task (Van Dijk, 2005). In particular, the substantial question of why, how and with what benefits and consequences of individuals using ICTs in developing countries will have to be addressed more profoundly in future research.

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