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Understanding the digital divide: A literature survey and ways forward

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Understanding the digital divide: A literature survey and ways forward

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Abstract

The term “digital divide” was introduced in the mid-1990s and defined as the gap separating those who have access to new forms of information technology from those who do not. The digital divide remains an important public policy debate that encompasses social, economic and political issues. This paper presents a literature review and classification scheme for digital divide research. The review covers journal articles published between 2001 and 2010 in three types of journals: (1) Information technology & information systems, (2) Economics and business & management and (3) Social science. A classification of digital divide literature and a comprehensive list of references are provided. The results show that the digital divide is a multifaceted phenomenon, due to the many dimensions of determinant factors. Recent studies have included socio-economic, institutional and physiological factors in order to gain a greater understanding of the digital divide. Among other findings, they show that technological determinism is not sufficient to explain the emergence of the digital divide. Moreover, several types of technologies were investigated, both from empirical and conceptual standpoints. The Internet is the most commonly studied technology. The divide in access and usage are discussed at the global, social and democratic levels by employing a quantitative method, either a survey or data analysis, as the main method. However, there is less discussion in developing countries and at the level of the organization (i.e. SMEs, the private sector and the public sector). The qualitative research method could be seen as a complementary method to fill the gap in the current research. The choice of policies which have been recommended to the policy maker and national regulatory agency (NRA) are also presented and discussed at the end of this paper. Several initiatives made at the country and regional levels and by international organizations have also attempted to create a combined policy. This may suggest that the combined policy is the current trend among digital divide policies. Therefore, there is a need for future research to examine these determinants through the context of global, social and democratic divides. The results would provide some insight into how diverse people in different areas adopt ICTs.

Keywords: Digital divide; Literature review; Future research

Understanding the digital divide: A literature survey and ways forward

Introduction

Information and communication technologies (ICTs) have been revealed as key potential factors for economic growth and social development. The diffusion of ICTs drives access to information and knowledge; the uneven distribution of ICTs within or between societies may result in their having a very uneven impact on economic development and on wealth. After the report 'Falling Through the Net' was released in the late 1990s (NTIA 1995; 1998; 1999; 2000), not only the U.S. government but also other developed and developing countries recognized the need to address this problem and were actively working towards finding solutions for eliminating disparities in ICTs, the so-called digital divide. The digital divide has become an extremely important issue for many international organizations and a major challenge for policy makers and academic researchers. (Billon, Marco & Lera Lopez, 2009)

At the beginning of research into the digital divide, the definition of the digital divide was broad and the term was loosely used to express either the disparity between people in their access to ICTs or more specifically, the disparity in their access to the Internet. From the end of the 1990s onwards, attempts to accurately define the digital divide are frequently seen. Scholarly literature and that of international organizations (van Dijk, 2002, 2003, 2006; Norris, 2001; OECD, 2001) pointed out that the divide should be defined in terms both of access and of the use of ICT. In addition, Norris (2001) and the OECD (2001) note that the digital divide can exist in a particular country and also between countries.

Today, many countries seek to create a society in which all citizens can reach and share information by trying to form supportive policies that narrow the digital gap. For example, the e-rate program in the U.S., administered by the Federal Communications Commission (FCC), has been instrumental in reducing the digital divide in America's schools (Jakayar, 2004). This program aims to provide a discount to most schools and libraries in the U.S. so that they can gain affordable telecommunications and Internet access. In the European Union, the term "e-inclusion" was introduced in 2006 by the European Commission as a part of the third pillar of the 2010 policy initiative (*i2010*) with the commitment to halving the digital divide by 2010 (EIU, 2008). Even in the ASEAN countries, there was the initiative of the e-ASEAN Framework Agreement in 2000. This initiative set four objectives, which included reducing the digital divide within and among the member countries. However, this has not yet been achieved, and there are still significant differences between individuals, groups, regions and countries in terms of reaching and sharing ICTs. In order to form successful policies, it is essential to determine the differences that exist in the use of ICTs between individuals, regions, or countries. In this context, the concept of a digital divide becomes important (Çılan, Bolat & Coşkun, 2009).

Accordingly, a literature survey is needed, because it will serve as a roadmap of digital divide research for both academics and policy makers. It will also indicate the current state and direction of research in this area. The paper is organized into four sections, including the foregoing introduction. Section 2 presents the research method and a profile of digital divide research. Section 3 explores the definition, the determinant factors and choices of policy that relate to the digital divide. Section 4 provides a discussion and suggests some areas for future research. Finally, this paper ends with concluding remarks in Section 5.

Research methodology

Due to its nature, research on the digital divide is difficult to confine to specific disciplines, and so the relevant material is scattered across various journals. Based on the frameworks of Norris (2001) and van Dijk (2003), work on the digital divide can be found in three types of journals: (1) Information technology and information systems (2) Economics and business and management and (3) Social science (see Figure 1). Consequently, the following online journal databases were searched to provide a comprehensive bibliography of the digital divide literature: the ABI/INFORM database, the ACM Digital Library, the Emerald Library and Science Direct.

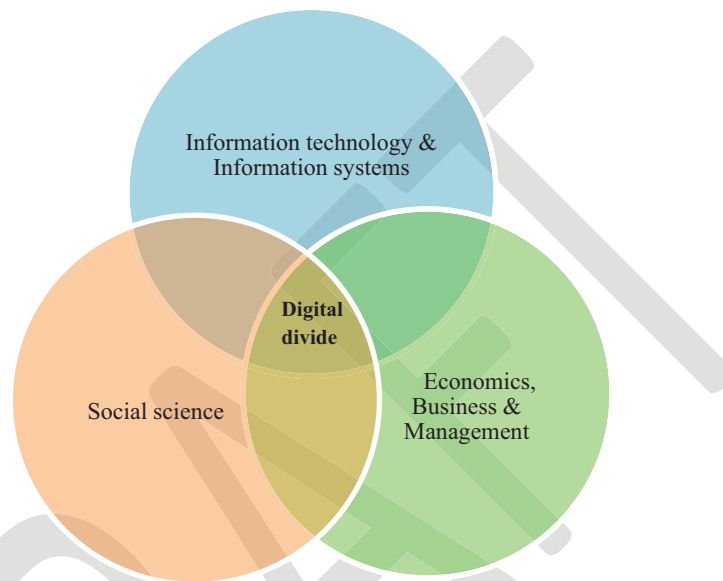


Figure 1. The digital divide in three types of journals

The literature search was based on one descriptor, which was digital divide. The full text of each article was reviewed to eliminate those articles that were not actually related to the digital divide. A selection criterion was that only articles that had been published in the three target types of journals were selected, as these were the most likely to be outlets for digital divide research. Conference papers, master and doctoral dissertations, textbooks and unpublished working papers were excluded, as academics and practitioners alike most often use journals for acquiring information and disseminating new findings, and journals thus represent the highest level of research. The search yielded 195 digital divide articles from 65 journals, which were published between 2001-2010 (see Appendix 1). Each of the 195 articles was reviewed and classified in accordance with the purposes of this study. Although this search was not exhaustive, it serves as a comprehensive base for an understanding of digital divide research.

Profile of digital divide publications

Within the literature on the digital divide, studies on computer/Internet/broadband dominated other ICT tools. A total of 143 articles (73.3%) analyzed the access to and use of computer/Internet/broadband. There were 35 articles (17.9%) that discussed the ICTs index, whereas mobile telephony and a combination of ICTs were each considered by only 8 articles (4.1%) (see Table 1).

Table 1 The digital divide by technologies

ICTs	Count	Percentage
Computer/Internet/broadband	144	73.5%
Fixed telephony	2	1.0%
Mobile telephony	8	4.1%
Multiples ICTs	8	4.1%
ICT Index	35	17.9%
Total	196	100.0%

Regarding the research methods, the findings suggest that although a total of eight different research methods were record in the literature survey, the majority of digital divide research employed survey (26.2%) and data analysis methods (20.5%). The other categories of methods that were employed were case study (17.9%), content analysis (11.3%), conceptual (8.7%), mixed method (8.2%), interview (6.2%) and experimental (1.0%) (see Table 2).

Table 2 Research method

Research method	Count	Percentage
Conceptual	17	8.7%
Content analysis	22	11.2%
Case study	35	17.9%
Data analysis	40	20.4%
Experimental	2	1.0%
Interview	12	6.1%
Mixed method (i.e. survey and in-depth interview)	16	8.2%
Survey	52	26.5%
Total	196	100.0%

Data from a total of 41 countries and 6 regions were utilized in these articles between the years 2001 and 2010. Considered by region, the largest number of studies was based on data collected from the Canada & USA region (24.5%), followed by Europe, Asia Pacific, global and Africa, with 24.0%, 22.6%, 16.3% and 6.7% respectively. The fifth and final large category comprised the studies in Latin America (3.8%) and in the Middle East (4%) (See Table 3). Assessed by country, most of the digital divide studies were observed in the U.S. (23.1%), followed by the UK (8.2%), India (5.8%) and then China (3.4%). Next were studies that utilized data collected from Australia, Germany, Korea, Singapore and The Netherlands, each with 1.9%, placing them at the fifth place (see Appendix 2).

Table 3 Geographic regions of data collection

Geographical region	Count	Percentage
Africa	14	6.7%
Asia Pacific	47	22.6%
Canada & USA	51	24.5%
Europe	50	24.0%
Latin-Americas	8	3.8%
Middle East	4	1.9%
Global	34	16.3%
Total	208	100.0%

Note: the number of countries is greater than the number of articles due to double counting for the comparison studies.

The results of our investigation into the most common unit of analysis employed suggested that the majority of articles examined digital divide issues at the individual level (34.4%), follow by studies focusing on country (33.3%), household (15.4%), public sector organization (10.8%), private organization (2.6%), industry (2.1%) and small and medium enterprises (SMEs) (1.5%).

Table 4 Unit of analysis

Unit of analysis	Count	Percent
Individual	68	34.7%
Household	30	15.3%
SMEs	3	1.5%
Private organization	5	2.6%
Public sector organization	21	10.7%
Industry	4	2.0%
Country	65	33.2%
Total	195	100.0%

Furthermore, the profile of digital divide research suggests that the largest number of articles investigated research issues related to ICT diffusion and adoption (28.1%), which was followed by Public policy and regulation (20.9%) and E-government (19.4%). The fourth most researched topic was Economic development (14.3%), followed by alternative technologies (9.7%). Finally, the ICT index and E-readiness represented 7.7% of the articles.

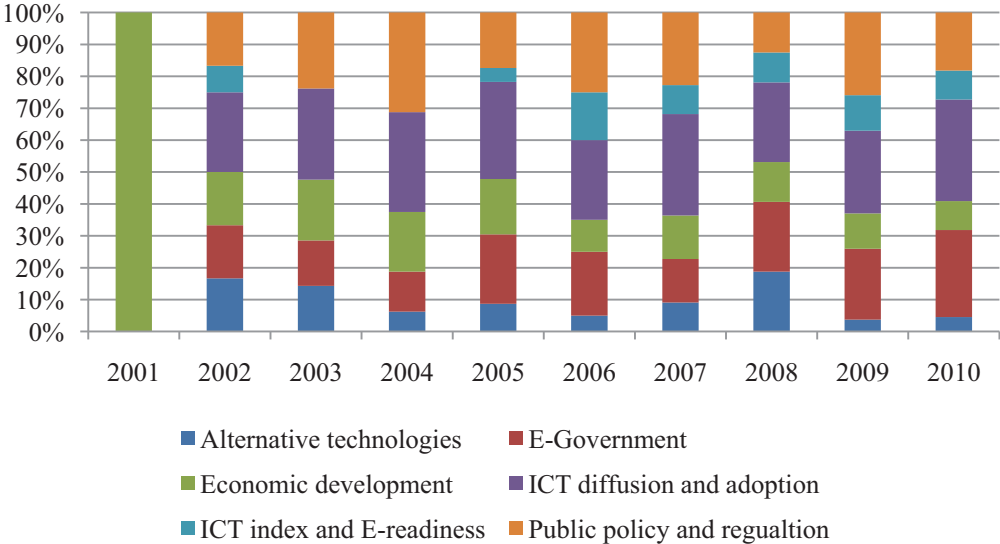


Figure 2. Major research topic related to digital divide

Defining the digital divide

According to the related literature, the term digital divide entered public discourse and became very popular in the last year of the 1990s (van Dijk, 2000). NTIA (1999) define the digital divide as the divide between those with access to ICTs and those without. The discussion of the digital divide initially employed an element of

technological determinism. The technological determinist view is a technology-led theory of social change¹. Technology is the sole or prime antecedent cause of changes in society, while human factors and social factors are seen as secondary (Smith & Marx, 1996). Many empirical studies (e.g. Lentz & Oden, 2001; Chowdary, 2002; Hartviksen, Akselson & Eidsvik, 2002; James, 2002, 2003; Lim, 2002; Ming & Li, 2002; Moss, 2002, etc.) focus on the equalization of access to ICTs in terms of physical access, using technological determinism theory in their hypotheses and conclusions. The gap in access could also be understood as a phenomenon with three distinct aspects, including a global divide (referring to ICT disparities between countries), a social divide (referring to the gap in access to ICT between different sections of a nation's society) and a democratic divide (referring to the difference between those who do and those who do not use the variety of digital means to engage in public life) (Norris, 2001). In accordance with technological determinism, liberalization and the opening up of markets are presented as being necessitated by the technology change that accompanies closing the digital divide. This implies that everyone has the same potential to use technology and to benefit from ICTs, provided that everyone has access to these. Though the above-mentioned authors utilized technological determinism in their research, they also supported the theory of social determinism² by including socio-economic factors in their analysis. Hence, this suggests that the theory of technological determinism is not sufficient to explain the situation regarding the digital divide.

With respect to the sociological and economic perspectives, a number of theories have been applied to understand the digital divide by Mason and Hacker (2003), for example, the diffusion of innovation theory, the knowledge gap hypothesis and public-private spheres. According to the diffusion theory, as innovative forms of technology emerge, they are not adopted "en masse" (Rogers, 1995). Rather, it is as the popularity and personal resources of the adopters increase that the innovation is adopted. van Dijk (2000) notes that the path of the physical access divide may follow the diffusion S-curve of innovations. The path is though much more complex and differentiated among groups within the population than the S-curve projects and there are serious problems with the mainstream diffusion theory regarding computer and Internet technology³. The argument of van Dijk (2000) can be seen as related to the argument about the knowledge gap hypothesis by Tichenor, Donohue and Olien (1970). The hypothesis explicitly considers that knowledge regarding the usage of adopted technologies is greater for those with higher socio-economic status and who are already well informed. Most scholars contend that the digital divide should be defined in term of both access and use (e.g. Hartviksen et al., 2002; Lim, 2002; Akhter, 200; Brown and Licker, 2003; van Dijk, 2003, van Dijk & Hacker, 2003; Selwyn, 2003, 2006, etc.).

¹ Technological determinism has developed into two subsets that are generally called 'hard' and 'soft determinism'. Hard determinism makes technology the sufficient condition for social change, while soft determinism simply emphasizes that technology is a key factor that may facilitate change.

² Social determinism means that the society concerned is responsible for the development and deployment of technology. The way that a technology is used in any given social or cultural context is a reflection of that society or culture. (Bijker, Hughes, & Pinch, 1987)

³ van Dijk (2006) compares the adoption curve with the normalization model and with a stratification model of diffusion. The results show that the differences between groups only increase in the early stages of adoption and, if a normalization model applies, disappear with the saturation in the last stages, or, if the stratification model applies, the gap persists.

Moreover, van Dijk (2002, 2006) pointed out that the divide of access and that of use should be conceptualized as continuums on multi-dimensions. The disparity of access should be seen as a range of differences along dimensions for hardware, software, mode of Internet connection, etc., and disparity of use should be seen as a range of differences along the dimensions of skills, literacy, mental access and types of usage (Lentz & Oden, 2001; van Dijk & Hacker 2003). In accordance with this, each of 195 articles was reviewed and classified according to subject heading of Norris (2001) and van Dijk and Hecker (2006). The articles were classified into three broad categories, as shown in Table 5.

Table 5 Types of digital divide

Type of digital divide	Number of articles	Percentage of subject	Percentage of all subjects
<i>Global divide</i>			
Access	33	60.0%	16.9%
Use	0	0.0%	0.0%
Both access and use	22	40.0%	11.3%
<i>Total</i>	55	100.0%	28.2%
<i>Social divide</i>			
Access	58	61.1%	29.7%
Use	7	7.4%	3.6%
Both access and use	31	32.6%	15.9%
<i>Total</i>	95	100.0%	49.2%
<i>Democratic divide</i>			
Access	20	44.4%	10.3%
Use	10	22.2%	5.1%
Both access and use	15	33.3%	7.7%
<i>Total</i>	45	100.0%	23.1%
Total	196		100.0%

The results show that the largest numbers of digital divide studies were in the area of social divide (49.2%), and in particular access (29.7%), which is followed by the studies on both access and use in social divide (15.9%), access in global divide (16.9%), including both access and use in global divide (11.3%), and access in democratic divide (10.3%). There were relatively few studies of the digital divide at other levels.

Apart from access and use, other dimension of the digital divide could be explained by the theory of public-private spheres. Keane (2000) explains that public spheres, which can be categorized into three levels (micro-, meso- and macro-sphere) serve as a platform for the negotiations that comprise society. ICTs allow citizens to move beyond the traditional idea of the public sphere and create new public spheres without the constraints of geography, time and political interest. In this way, they recreate the structure of society by renegotiating rules, roles and meaning. It also provides opportunities for citizens who have no connection to networks with other citizens. This theory presents the impact of ICTs on power, in particular the impact of the Internet on society. It also implicitly reveals that an institutional perspective can act as a lens through which to explain digital divide phenomena at individual, national and global levels. A number of studies support this idea by considering the taxonomy of the institution which has influence over the policies, regulation and market mechanism of ICTs

(e.g. Chowdary, 2002; Lim, 2002; Ming & Li, 2002; Wong, 2002; McSorley, 2003; Roseman, 2003; Roycroft & Anantho, 2003; Selwyn, 2003; Sharma & Gupta, 2003, etc.)

In addition to the attempts to define the digital divide as continuums of disparity along multifaceted dimensions, there have also been attempts to define the concept accurately in a quantitative manner, both at the regional (Beynon-Davies & Hill (2007) and global level (Corrocher & Ordanini, 2002; Bagchi, 2005; Hanafizadeh, Saghaei & Hanafizadeh 2009b; Emrouznejad, Cabanda and Gholami, 2010). At the regional level, Beynon-Davies and Hill (2007) developed a digital divide index to highlight the multifaceted nature of this phenomenon within a regional context. The index allows the comparison of technology adoption rates, both regarding access and use, among four “at risk” groups (females, persons aged over 50 years old, persons with limited formal education and persons receiving a low income) with the technology adoption rates among the population average. They defined the digital divide as the individual who falls behind the population average in terms of Internet access and use.

Considering the global level, Corrocher and Ordanini (2002) point out that there are at least six determinant factors that determine the digital divide between countries. These are markets, diffusion, infrastructures, human resources, competitiveness, and competition. These factors were quantified and constructed into a single index. Similarly, Bagchi (2005), Hanafizadeh, Saghaei and Hanafizadeh (2009b) and Emrouznejad, Cabanda and Gholami, (2010) developed the digital divide index, which is built upon defining and conceptualizing the ICT infrastructure, access and the skill of the user. These indexes use core ICT indicators on which the international community and experienced modelers have reached the consensus that they provide suitable measurements of the information society.

In the light of all such circumstances, there appears to be converging viewpoint that the digital divide is not just about access to technology, but rather that it has socio-economic and institutional components. The digital divide can refer to the disparity between individuals, households, communities and/or countries at different socio-economic and institutional levels who have or who do not have the opportunity to access and use ICTs.

The determinant factors of the digital divide

The digital divide is not restricted to access to the technical infrastructure, but also to the social infrastructure that supports ICT (Rooksby, Weckert & Lucas, 2002). This includes socio-demographic factors such as income, gender, race, ethnicity, education, age and location, as well as the institution (Choudrie et al., 2005). Each of the 195 articles was reviewed and classified according to the subject headings of Helbig, Gil-García and Ferro (2009). The articles were classified into 3 broad categories, technology access approach, multi-dimension approach and multi-perspective approach, and each of these was divided into sub-categories as shown in Table 6.

Helbig et al. (2009) proposed three levels of factors influencing the digital divide. The first level is the technology access approach, which is close to the idea of technological determinism. The digital divide, like any other technological divide, does not have a special ethical or political meaning. Based on this assumption, the important factors at this level should be the availability of the infrastructure and infrastructure investment, since once everyone has access the digital gap will be narrowed. The next level is the multi-dimension approach.

Helbig et al. (2009) note that there are many dichotomous divides or multiple dimensions; it is not only a question of having access or not. These dimensions could be, for example, socio-economic status, skills, geography and education. The last level considers that the digital divide may be understood by examining the various ways that different factors (e.g. age, gender race, etc.) interact to shape the experiences of the users.

Table 6 Determinant factors of the digital divide

Factor	Focal point	Related literature
<i>1. Technology access</i>		
1.1 Availability of the infrastructure (including the availability of related technologies e.g. fixed phone, mobile phone and Wi-Fi and WiMax)	The availability of the infrastructure predicts the likelihood of the adoption and the extent of the use of ICT	Lentz and Oden (2001), Chowdary (2002), Hartviksen et al (2002), James (2002, 2003), Lim (2002), Ming and Li (2002), Moss (2002), Ngini et al. (2002), Sexton et al. (2002), Wong (2002), Breiter (2003), Brown and Licker (2003), Cullen (2003), Fink and Kenny (2003), Roseman (2003), Roycroft and Anantho (2003), Sharma and Gupta (2003), Bozionelos (2004), Eastman and Iyer (2004), Kanungo, S. (2004), Kebede (2004), Jayakar (2004), Mutula (2004), Mwesige (2004), Pook and Pence (2004), Simpson et al. (2004), Bagchi (2005), Chin (2005), Choudrie et al. (2005), Fairlie (2005), Hawkins (2005), Hubregtse (2005), Kalusopa (2005), Oyelaran-Oyeyinka and Lal (2005), Rao (2005), Sun and Wang (2005), Cava-Ferreruela and Alabau-Muñoz (2006), Cooke and Greenwood (2008), Deichmann (2006), Demoussis and Giannakopoulos (2006), Gibbons and Ruth (2006), Hassani (2006), Huang and Russell (2006), Igun and Olise (2008), Mutula and van Brakel (2006), Vicente Cuervo and López Menéndez (2006), Wood (2008), Xiong (2006), Alam and Ahsan (2007), Beynon-Davies and Hill (2007), Blackman (2007), Guasch and Ugas, (2007), LaRose et al. (2007), Ono and Zavodny (2007), Powell (2007), Reisenwitz et al. (2007), Robertson et al. (2007), Ryder (2007), Teo (2007), Warren (2007), Engelbrecht (2008), Ganapati and Schoepp (2008), Gómez-Barroso and Robles-Rovaló (2008), Hohlfeld et al. (2008), Ishmale et al. (2008), Kim (2008), Noh and Yoo (2008), Singh and Sahu (2008), Szabó et al. (2008), Yuguchi (2008), Ashraf et al. (2009), Avila (2009), Çilan et al. (2009), Salinas and Sanchez (2009), Emrouznejad et al. (2010), Haßler and Jackson (2010), Klimaszewski and Nyce (2009), Liao and Chang (2010), Niehaves et al. (2010), Pal (2009), Emrouznejad et al.

Factor	Focal point	Related literature
		(2010), Haßler and Jackson (2010), Puga et al. (2010), Pieri and Diamantinir (2010), Wetzl, A. (2010), Wilbon (2010), Yu (2010)
1.2 Infrastructure investment	A greater level of ICT infrastructure would lead to a greater diffusion rate and reduce the digital gap	Chowdary (2002), Ming and Li (2002), Sharma and Gupta (2003), Pook and Pence (2004), Hawkins (2005), Cava-Ferreruela and Alabau-Muñoz (2006), Gómez-Barroso and Robles-Rovalo (2008), Noh and Yoo (2008), Avila (2009)
<i>2. Multi-dimensional approach</i>		
2.1 Income/socioeconomic status/GDP per capita	An individual or country in a more privileged socio-economic situation is expected to have a smaller digital gap	Bosman (2002), Ming and Li (2002), Wong (2002), Akhter (2003), Fink and Kenny (2003), Rice and Katz (2003), Roycroft and Anantho (2003), Quibria et al. (2003), Bozionelos (2004), Eastman and Iyer (2004), Pook and Pence (2004), Whaley (2004), Wareham et al. (2004), Azari and Pick (2005), Bagchi (2005), Fairlie (2005), Mariscal (2005), Oyelaran-Oyeyinka and Lal (2005), Cava-Ferreruela and Alabau-Muñoz (2006), Deichmann (2006), Hassani (2006), Vicente Cuervo and López Menéndez (2006), van Dijk (2006), Yap et al. (2006), Beynon-Davies and Hill (2007), Dwivedi and Lal (2007), Flamm and Chaudhuri (2007), Hitt and Tambe (2007), LaRose et al. (2007), Ono and Zavodny (2007), Robertson et al. (2007), Warren (2007), Barrantes and Galperin (2008), Engelbrecht (2008), Goldfarb and Prince (2008), Hohlfeld et al. (2008), Noce and McKeown (2008), Noh and Yoo (2008), Prieger and Hu (2008), Billon et al. (2009), Orviska and Hudson (2009), Andrés (2010), Chakraborty and Emrouznejad et al. (2010), Gauld et al.(2010), Martinez and Williams (2010), Shirazi et al. (2009), Schleife (2010), Wilbon (2010)

Factor	Focal point	Related literature
2.2 Skills and experience	A lack of ICTs skills and experience will widen the digital gap	Sexton et al. (2002), Brown and Licker (2003), Hollifield and Donnermeyer (2003), Eastman and Iyer (2004), James (2004), Kebede (2004), Kalusopa (2005), Fisher and Bendas-Jacob (2006), Mutula and van Brakel (2006), Selwyn (2006), van Dijk (2006), Vicente Cuervo and López Menéndez (2006), Xiong (2006), Hitt and Tambe (2007), LaRose et al. (2007), Reisenwitz et al. (2007), Hill et al. (2008), Srite et al. (2008), Tien and Fu (2008), Vie (2008), Çilan et al. (2009), García-Jiménez and Gómez-Barroso (2009), Salinas and Sanchez (2009), van Deursen, and van Dijk (2009a), Gauld et al.(2010), Salajan et al. (2010), Waycott et al. (2010), Wilbon (2010), Yu (2010)
2.3 Geography/rural-urban location and population density	Urban populations may benefit from easier and cheaper access to ICT infrastructure because adoption costs will decrease with population size and density increase	Chowdary (2002), Cullen (2003), Rowe (2003), Simpson et al. (2004), Whaley (2004), Wareham et al. (2004), Bagchi (2005), Chaudhuri et al. (2005), Chin (2005), Choudrie et al. (2005), Mariscal (2005), Cava-Ferreruela and Alabau-Muñoz (2006), Selwyn (2006), Akca et al. (2007), Gómez-Barroso and Pérez-Martínez (2007), Flamm and Chaudhuri (2007), Goldfarb and Prince (2008), Noce and McKeown (2008), Prieger and Hu (2008), Wood (2008), Yartey (2008), Yuguchi (2008), Billon et al. (2009), Orviska and Hudson (2009), Savage and Waldman (2009), Chen et al. (2010), Gauld et al.(2010), García-Jiménez and Gómez-Barroso (2009).Liao and Chang (2010), Moon et al. (2010), Park and Jayakar (2010), Schleife (2010)
2.4 Education/literacy	People with higher education will be more prone to use and adopt ICTs than less educated people.	Hartviksen et al. (2002), Lim (2002), Akhter (2003), Brown and Licker (2003), Hollifield and Donnermeyer (2003), Rice and Katz (2003), Sharma and Gupta(2003), Mwesige (2004), Simpson et al. (2004), Wareham et al. (2004), Eastman and Iyer (2004), Kanungo, S. (2004), Azari and Pick (2005), Bagchi (2005), Fairlie (2005), Kalusopa (2005), Cava-Ferreruela and Alabau-Muñoz (2006), de Koning and Gelderblom (2006), Demoussis and Giannakopoulos (2006), Deichmann (2006), Hassani (2006), Peter and Valkenburg (2006), Schleife (2010), Selwyn (2006), van Dijk (2006), Xiong (2006), Yap et al. (2006), Beynon-Davies and Hill (2007), Dwivedi and Lal (2007), Flamm and Chaudhuri (2007), Ono and Zavodny (2007), Warren (2007), Zhao et al. (2007), Ameen and

Factor	Focal point	Related literature
		Gorman (2008), Cooke and Greenwood (2008), Goldfarb and Prince (2008), Noce and McKeown (2008), Noh and Yoo (2008), Prieger and Hu (2008), Rice and Katz (2008), Vie (2008), Alam et al. (2009), Ashraf et al. (2009), Avila (2009), Billon et al. (2009), Klimaszewski and Nyce (2009), Orviska and Hudson (2009), van Deursen, and van Dijk (2009a), van Deursen, and van Dijk (2009b), Emrouznejad et al. (2010), Engelbrecht (2008), Gauld et al.(2010), Liao and Chang (2010), Moon et al. (2010), Robertson et al. (2007), Shirazi et al. (2009), Shirazi et al. (2010).
2.5 Family structure (number of children, or teenagers at home)	Children's current use of ICTs in the home will increase the probability of ICT use among other family members	Rice and Katz (2003), Demoussis and Giannakopoulos (2006), Hitt and Tambe (2007), Goldfarb and Prince (2008), Prieger and Hu (2008), Noce and McKeown (2008), Liao and Chang (2010), Schleife (2010), Wilbon (2010)
2.6 Age	Elderly people show greater reluctance to adopt new technologies than teenagers	Akhter (2003), Hollifield and Donnermeyer (2003), Rice and Katz (2003), Mwesige (2004), Whaley (2004), Chaudhuri et al. (2005), Fairlie (2005), de Koning and Gelderblom (2006), Demoussis and Giannakopoulos (2006), Peter and Valkenburg (2006), Selwyn (2006), Beynon-Davies and Hill (2007), Dwivedi and Lal (2007), Flamm and Chaudhuri (2007), LaRose et al. (2007), Ono and Zavodny (2007), Goldfarb and Prince (2008), Noce and McKeown (2008), Prieger and Hu (2008), Rice and Katz (2008), Abbey and Hyde (2009), Alam et al. (2009), Middleton and Chambers (2009), Orviska and Hudson (2009), van Deursen, and van Dijk (2009a), Gauld et al.(2010), Moon et al. (2010), Pieri and Diamantinir (2010), Salajan et al. (2010), Schleife (2010)
2.7 Cost of access/ price	A cheaper cost of access will increase the probability of the access and use of ICTs	Chowdary (2002), Chaudhuri et al. (2005), Xiong (2006), Flamm and Chaudhuri (2007), Robertson et al. (2007), Barrantes and Galperin (2008), Engelbrecht (2008), Billon et al. (2009), Savage and Waldman (2009).
2.8 Occupation (Professional worker/employment)	Professional, scientific and /or technical workers are	Rice and Katz (2003), Wareham et al. (2004), Azari and Pick (2005), Chaudhuri et al. (2005), Demoussis and Giannakopoulos (2006), Dwivedi and Lal (2007) Flamm and

Factor	Focal point	Related literature
	more likely to access and use ICT tools than are other workers.	Chaudhuri (2007), Billon et al. (2009), Salajan et al. (2010), Schleife (2010).
2.9 Marital status	Marital status seems to have a highly significant effect on gaining access to ICTs	Rice and Katz (2003), Wareham et al. (2004), Chaudhuri et al. (2005), Selwyn (2006), Flamm and Chaudhuri (2007), Goldfarb and Prince (2008), Rice and Katz (2008), Schleife (2010), Orviska and Hudson (2009).
<i>1. Multi-perspective approach</i>		
3.1 Institution, structure and type of government (e.g. public policy, rule of law, level of competition and regulation)	Public policies and regulation play a significant role in promoting or inhibiting ICT diffusion	Chowdary (2002), Lim (2002), Ming and Li (2002), Wong (2002), McSorley (2003), Roseman (2003), Roycroft and Anantho (2003), Selwyn (2003), Sharma and Gupta(2003), Greco and Floridi (2004), Kebede (2004), Mutula (2004), Papazafeiropoulou (2004), Simpson et al. (2004), Azari and Pick (2005), Chin (2005), Goth (2005), Kalusopa (2005), Kasusse (2005), Mariscal (2005), Mistry (2005), Gibbons and Ruth (2006), Mutula and van Brakel (2006), Yap et al. (2006), Blackman (2007), Ryder (2007), Zhao et al. (2007), Åkesson et al. (2008), Blackman and Forge (2008), Kim (2008), Letch and Carroll (2008), Prieger and Hu (2008), Recabarren et al. (2008), Singh and Sahu (2008), Wood (2008), Xia and Lu (2008), Yartey (2008), Yuguchi (2008), Al-Jaghoub and Westrup (2009), Avila (2009), Billon et al. (2009), Pal (2009), Shirazi et al. (2009), Andrés (2010) Hohlfeld et al. (2010), Martinez and Williams (2010), Sang et al. (2009), Shirazi et al. (2010), Xia (2010)
3.2 Race	A major race in a given country is more likely to access and use ICT tools	Chakraborty and Bosman (2002), Jackson et al. (2003), Whaley (2004), Chaudhuri et al. (2005), Fairlie (2005), Selwyn (2006), Flamm and Chaudhuri (2007), Goldfarb and Prince (2008), Prieger and Hu (2008), Alam et al. (2009)
3.3 Ethnic	ICT adoption and use varies by ethnic group, e.g. white users have a higher rate of ICT adoption than do Asian, African and Hispanic users	Jackson et al. (2003), Wareham et al. (2004), Chaudhuri et al. (2005), Fairlie (2005), Flamm and Chaudhuri (2007), Kim et al.(2007), Prieger and Hu (2008), Tien and Fu (2008), Middleton and Chambers (2009)

Factor	Focal point	Related literature
3.4 Gender (Male)	Men are more likely to access and use ICT tools than are woman	Sexton et al. (2002), Trauth (2002), Akhter (2003), Rice and Katz (2003), Chaudhuri et al. (2005), Winker (2005), de Koning and Gelderblom (2006), Peter and Valkenburg (2006), Selwyn (2006), Flamm and Chaudhuri (2007), Ono and Zavodny (2007), Goldfarb and Prince (2008), Prieger and Hu (2008), Rice and Katz (2008), Tien and Fu (2008), Alam et al. (2009), Orviska and Hudson (2009)
3.5 Culture ⁴	Persons belonging to different cultures may have different perceptions of ICT, which will lead to different ICT adoption rate.	Hubregtse (2005), Praboteeah et al. (2005), Zhao et al. (2007). Hill et al. (2008), Recabarren et al. (2008), Srite et al. (2008), Al-Jaghoub and Westrup (2009), Klimaszewski and Nyce (2009),
3.6 Language (English)	English is a potential predictor of digital divide, in particular for the Internet.	Roycroft and Anantho (2003), Chin (2005), Gamage and Halpin (2007), Noce and McKeown (2008), Alam et al. (2009), Wetzl, A. (2010).
3.7 Psychological factors (e.g. attitudes, and trust)	A favorable attitude towards ICT will influence the adoption of ICT.	Brown and Licker (2003), Cullen (2003), Jackson et al. (2003), Oxedine et al. (2003), Bozionelos (2004), Kebede (2004), Bagchi (2005), Hubregtse (2005), Broos and Roe (2006), Hinson and Sorensen (2006), van Dijk (2006), Vogelwiesche et al. (2006), Reisenwitz et al. (2007), Warren (2007), Carter and Weerakkody (2008), Hill et al. (2008), Klecun (2008), Das et al. (2009), Chen et al. (2010), Gomez and Gould (2010), Moon et al. (2010), Pieri and Diamantinir (2010), Waycott et al. (2010), Wilbon (2010)
3.9 Direct network effect	The number of ICT users (in a given country) in the previous year is a powerful determinant of the number of ICTs user in the	Cava-Ferreruela and Alabau-Muñoz (2006), Demoussis and Giannakopoulos (2006), Yartey (2008), Andrés (2010)

⁴ Culture refers to the values, beliefs and practices that influence the ways individuals interpret the world and can manifest itself in a variety of social settings, including homes, schools and communities. Technologies are not culturally neutral or value-free, and can impact significantly on the habits, folkways, outlooks and identities normally associated with culture (Hill et al., 2008)

Factor	Focal point	Related literature
	current year.	
3.10 Content	Content suited to the preferences and needs of the user will decrease the digital gap	Kuk (2002), Ngini et al. (2002), Kebede (2004), Mwesige (2004), Simpson et al. (2004), Choudrie et al. (2005), Harrison et al. (2005), Kalusopa (2005), Rao (2005), Sun and Wang (2005), Ke and Wei (2006), Mutula and van Brakel (2006), Peter and Valkenburg (2006), Alam and Ahsan (2007), Teo (2007), Hohlfeld et al. (2008), Tien and Fu (2008), Rice and Katz (2008), Vie (2008), Alam et al. (2009), Orviska and Hudson (2009), Sang et al. (2009), Salajan et al. (2010), Waycott et al. (2010)
3.11 Speed and quality of service	A higher quality of service and a faster Internet connection speed will increase the adoption rate	Kuk (2002), Ngini et al. (2002), Chin (2005), Rao (2005), Mutula and van Brakel (2006), Prieger and Hu (2008), Savage and Waldman (2009), Glass and Stefanova (2010),

There are a number of factors that contribute to this disparity, all of which must be dealt with if the divide is to be closed in any level. These factors can be summarized as shown in Figure 3. Interestingly, there are several factors, for example, skill and experience, education, cost of access, institutional structure, race, ethnicity, culture, psychological factors, direct network effects, content and the speed and quality of service, that many scholars have been paying attention to since 2005. These factors confirm that digital divide research has moved beyond the technological access concept.

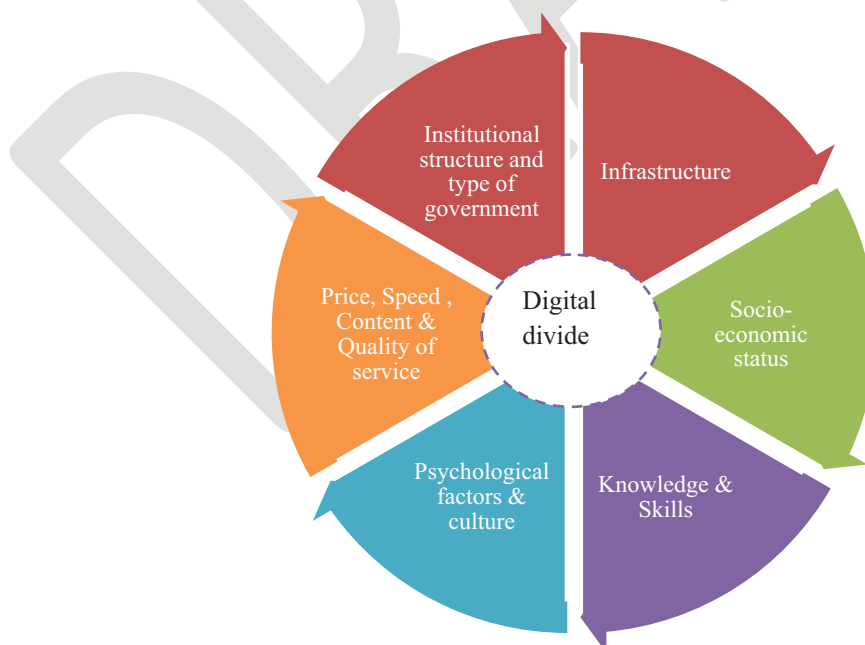


Figure 3 Determinant factors of digital divide

Choices of policies for bridging the digital divide

Most of the studies in the survey proposed policy recommendations for tackling the issue of the digital divide. These recommendations are based on the definition of the digital divide and on the determinant factors, and cover a wide array of policies and actions. In this study, three clusters of policy recommendations seem to have emerged in the literature, which can be found both in developed and in developing countries (see Figure 4).

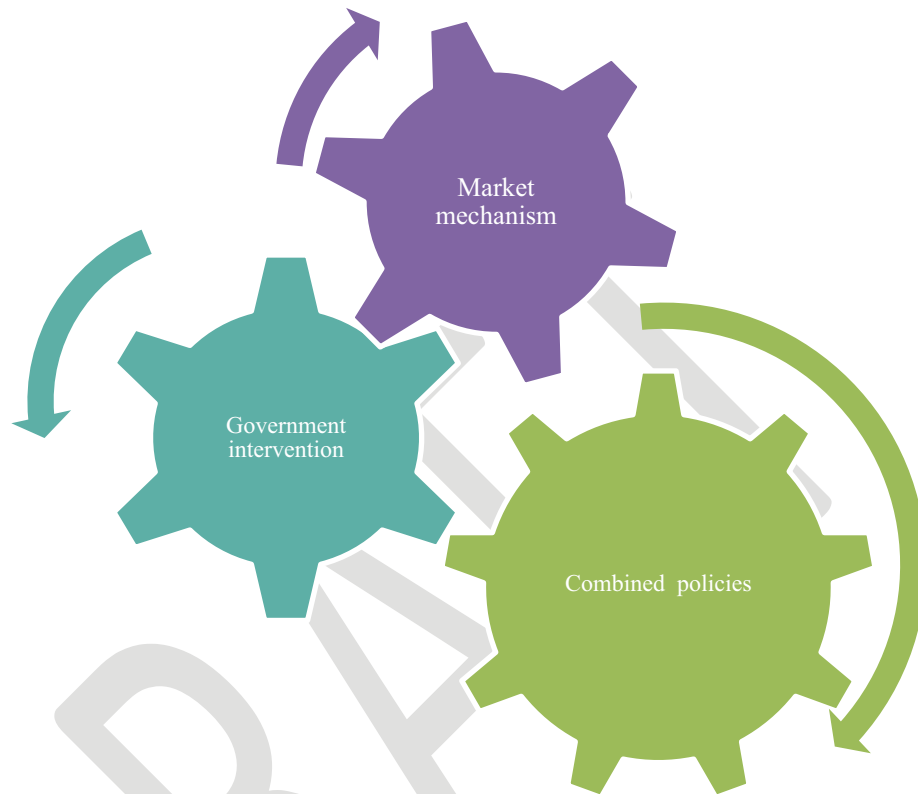


Figure 4. Clusters of policy recommendations

The first cluster contends that ICTs, like any other technological inventions in the past, will be diffused by market forces to the vast majority in society. The current digital divide will only exist as a transient phenomenon. There is no need for government intervention, because subsidies from the government distort investment patterns and lead to inefficient resource allocation (as cited in Mariscal, 2005). A competitive environment will encourage technological innovation and prices will decrease for many users (Wareham et al., 2004; Lai and Brewer, 2006; Andrés et al., 2010; Haßler & Jackson, 2010). In particular, developing countries need to speed up the liberalization of their telecommunication sector (Billon et al., 2009). Recently, many studies have shown that the diffusion of technology can help developing countries and/or people in rural areas to catch up in terms of the access that they enjoy to ICTs, in particular for Internet provided by wireless technologies (Gibbons & Ruth, 2006; Gunasekaran & Harmantzis, 2007; Gómez-Barroso & Robles-Rovalo, 2008; Ishmael et al., 2008; Middleton & Chambers, 2010). Genasekaran and Harmantzis (2007) reveal that the deployment of wireless services has three main characteristics, accessibility, availability and affordability of service and application, which provide the opportunity to advance digital inclusion.

The second cluster argues that the digital divide will not diminish without governmental interference (Chowdary, 2002; Wong, 2002; Roycroft & Anantho, 2003; Mariscal, 2005; Mathur & Ambini, 2005;). This cluster believes that a certain degree of government interference is needed to bridge the digital gap. Cava-Ferreruela and Alabau-Muñoz (2006) categorized the degree of intervention into three levels, soft, medium and hard intervention, by using broadband as an example. Soft intervention tends to create the appropriate conditions for market development, for example unbundling policies, right of way, increased radio spectrum allocation, reducing taxation and financial incentives for users (Barrantes & Galperin, 2008; Igun & Olise, 2008). There are two main arguments that supported this idea. Firstly, the development of some ICT infrastructure is still at an early stage and an excessive government involvement may distort competition and affect future market development. Secondly, strong market competition is considered to be an essential requirement to ensure the efficient supply of services and technological innovation. However, there are geographic areas that are likely to remain underserved (rural areas and low population density areas). It is reasonable to consider public funding for infrastructure supply in these areas. This strategy is referred to as medium intervention, while hard intervention can be seen as a strategy that is characterized by very proactive government involvement. With regard to medium intervention, several strategies have been recommended, for example, subsidizing internet access to low-income and less-educated people (Demoussis & Giannakopoulos, 2006; Ono & Zavodny, 2007; Goldfarb & Prince, 2008; Ashraf et al., 2009; Park & Jayakar, 2010), collaboration between public and private partners to build infrastructure (Lattemann et al., 2009; Qiang, 2010) and public access facilities (Hartviksen et al., 2002; Billion et al., 2009).

The third cluster tends to emphasize the need to address social, political and cultural aspects that are related to the digital divide. The differential access and ability to use technologies is rooted within various factors. Therefore, people will choose to use technologies differently for many reasons, but people also use technology differently because they are situated within various contexts or intersecting factors. Consequently, the policy maker should design policies that integrates the needs and restraints of the users (McSorley, 2003; Mariscal, 2005; Mutula & van Brakel, 2006; Blackman, 2007; Fuch & Horak, 2008; Zambrano, 2008; Hanafizadeh et al., 2009a; Helbig et al, 2009). Recommendations proposed by studies of this group are therefore likely to urge the government to take greater responsibility in ensuring equitable ICT access and use after the market has operated.

From the supply perspective, funding and supporting R&D in the country is a long term initiative, but its need remains, in particular for developing countries (Azeri & Pick, 2005). The introduction of localized technological innovations reduces technological dependency, makes the best use of the local endowments and provides major opportunities for taking advantage of new technological systems. A parallel effort to change the structure of relative prices may help in reducing the production costs (Antoelli, 2003). Similarly, Hollifield and Donnermeyer (2003) propose encouraging locally owned businesses to adopt information technologies as a means of maximizing local diffusion and increasing demand levels. From the demand perspective, government can provide support to socially diverse groups. For example, it can encourage the development of a wide range of interesting local content and high-quality of services in the community to which these groups belong (Gebremichael & Jackson, 2006; Akca et al., 2007; Billion et al., 2009). It might increase the perceived value of ICTs and consequently it could raise the proportion of ICT adoption. Moreover, improving institutional strength and aid effectiveness seems to be essential to closing the digital divide. Notably, the improvement of educational

conditions would provide an important catalyst to sustainable digital progress (Jutla et al., 2002; Quibria et al., 2003; Wijers, 2010). Hence, the ideas of this group strengthen the view that efforts to bridge the gap should not only pay attention to technological development and innovations. Rather, policy makers should also holistically address matters of improving the human capital of a global society. Focusing on the social, educational, diversity and skills context of technological change will be beneficial to all stakeholders.

Discussion: Trends and gaps in digital divide research

As already noted, the digital divide has been an area of interdisciplinary concern since the mid-1990s. The profile of digital divide research suggests that the largest number of articles investigated research issues related to ICT diffusion and adoption. The major ICT discussed in this field was the Internet. The reason might be that the supply of information by the Internet is more heterogeneous and potentially unlimited than for other ICTs, while on the other hand access to the Internet is still restricted in many countries due to technical and economic barriers. Furthermore, in comparison to the other ICTs, the use of the Internet requires a much more active and skilled user (Bonfadelli, 2002). As governments worldwide increasingly implement e-government services, concerns about the potential impact of the digital divide continue to grow. The digital divide has been identified as a major barrier to the effective deployment of e-government (Choudrie et al., 2005, Helbig et al., 2009). Specifically, the issues of e-government, the ICT index and e-readiness and alternative technologies for bridging the digital divide have been gradually increasing since 2004, while the issue of ICT adoption and diffusion, public policy and regulation remain important over time.

The definition of the digital divide is dynamic. In the literature, most of the studies focused on access during the years 2001 to 2004. Later, the definition was extended beyond access. The existing literature reveals that the gap in access was discussed at every level of the digital divide, while the gap in use was relatively little discussed at any level. It clearly shows that the gap in use at all levels needs to be investigated further. In addition, these studies also indicate that the use of qualitative research methods, in particular interviews, is still needed, since these would add more depth to our understanding of the digital divide. There are some influential factors that research needs to take into account and that are difficult to quantify, for example, culture, psychological factors, content and the quality of service. The use of interviews could potentially indicate how and why being digitally excluded can impact on exclusion from others in society and also vice versa.

Digital divide studies at the global level are more focused on developed countries, for example, the U.S. and the U.K. rather than on developing countries. Our investigation also reveals that though it has been recognized that SMEs and the private sector contribute to economic development through employment generation and the creation of added value, the digital divide within and between industries, organizations and SMEs were not explicitly discussed. Most studies were commonly discussed in the context of the individual, household and country level. To fill this gap, future research should examine the adoption and use of ICTs in these organizations and also explore how market and public policies affect their adoption.

Considering choices of policy, many scholars stress that liberalization and competition in the telecommunication sector remains important for the diffusion of ICTs and for bridging the digital divide. Subsidies or intervention

from the government may lag behind the development of technologies. This will result in a waste of public money. Moreover, wireless technology could become an alternative technology for narrowing the gap at many levels. However, little research has been conducted that examines the use of this technology to bridge the digital divide. The next choices of policy are government intervention. The majority of the studies related to this choice of policy focused on the intervention in access rather than in usage. Very few literature studies reported on how government intervention can encourage disadvantaged people to adopt more ICTs and their contents. Moreover, the comparison of government intervention between countries, in particular between developed and developing countries, needs to be further discussed. The combined policy, which is the last policy cluster, indicated that social, political and cultural aspects are important for closing the digital divide, and not only market mechanisms. Several initiatives at the country and regional levels, as well as international organizations, have also realized this issue. This may suggest that the combined policy is the current trend in digital divide policies. This is because these factors may affect economic development and country competitiveness in the long run. Given the prevalence of ICTs, the infrastructure alone could not accelerate the competitiveness of a country. The ability of consumers, businesses and governments to use ICT to their benefit will be another crucial factor. Therefore, there is a need for future research to examine these determinants through the context of the global, social and democratic divides. The results would provide some insight into how diverse people in different areas adopt ICTs.

Conclusion

The digital divide is not a new issue for academics and practitioners, but it remains a fruitful research topic due to its impact on society and on economic development. This study aims to indicate the current state and direction of research in this area through the use of a literature survey. The review covers 196 articles published between 2001 and 2010 from 65 scientific journals in three fields: (1) Information technology & information systems, (2) Economics and business and management and (3) Social science. The survey of the literature suggests that the definition of the digital divide has now moved beyond access, due to the action of determinant factors. Several factors are presented and their relationship to the digital divide is indicated. Many of the recent studies included social and psychological factors. Several types of ICTs were investigated, both from empirical and conceptual standpoints. The Internet is the most common technology studied. A major research topic, the investigation of the digital divide is not limited to the adoption and diffusion of ICTs, public policy and regulation, as has been the case in earlier studies, but rather it is also linked to the issue of e-government, ICTs index and e-readiness and alternative technologies for bridging the digital divide.

However, there are ways forward in this research topic. The digital divide in access and usage were discussed at three levels (the global, social and democratic levels) by employing a quantitative method, either survey or data analysis, as the main method. However, there was less discussion in developing countries and at the level of the organization (e.g. SMEs, the private sector and the public sector). Moreover, the qualitative research method could be seen as a complementary method with which to fill the gap in current research. Considering choices of policies, the findings show that the diffusion of wireless technology or other alternative technologies would be helpful in narrowing the digital divide, in particular for developing countries. There were, however, few studies that presented empirical findings and that discussed in greater depth successful conditions. Moreover, future

research on government intervention policies and combined policies should be carried out, as there was a lack of comparison studies.

DRAFT

Appendix 1 Distribution by journal and type of journal

Journal name	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Percentage of all journals
Aslib Proceedings	0	0	0	0	0	0	0	1	0	0	1	0.5%
Computer	0	0	0	0	1	0	0	0	0	0	1	0.5%
Computer in Human Behavior	0	0	0	0	0	0	0	1	1	0	2	1.0%
Computers & Education	0	0	0	0	0	0	0	2	0	3	5	2.6%
Computers and Composition	0	0	0	0	0	0	1	1	0	1	3	1.5%
Economics of Education Review	0	0	0	0	1	0	0	0	0	0	1	0.5%
Education and Information Technologies	0	1	1	0	0	0	0	0	0	0	2	1.0%
Ethics and Information Technology	0	1	1	1	0	0	0	0	0	0	3	1.5%
Futures	0	0	1	0	0	0	0	0	0	0	1	0.5%
Government Information Quarterly	0	0	3	0	1	1	1	2	4	2	14	7.1%
Habitat International	0	1	0	0	0	0	0	0	0	0	1	0.5%
IEEE Internet Computing	0	0	0	0	1	0	0	1	0	0	2	1.0%
IEEE Transactions on Learning Technologies	0	0	0	0	0	0	0	0	1	0	1	0.5%
Industrial Management & Data Systems	0	0	0	0	0	0	1	0	0	0	1	0.5%
Info	0	2	2	1	0	0	1	5	0	1	12	6.1%
Informatica Economică	0	0	0	0	0	0	0	0	3	0	3	1.5%
Information & Management	0	0	0	0	0	1	0	0	1	1	3	1.5%
Information Economics and Policy	0	2	1	0	0	1	1	3	1	0	9	4.6%
Information System Frontiers	0	0	0	0	0	0	0	1	2	0	3	1.5%
Information Technology & People	0	0	0	1	0	0	1	2	0	0	4	2.0%
Information Technology & People	0	1	0	0	0	0	0	1	0	2	4	2.0%
Interacting with Computers	0	0	0	0	0	0	0	0	1	0	1	0.5%
Interactive Technology and Smart Education	0	0	0	0	0	0	0	0	0	1	1	0.5%
International Journal of Educational Development	0	0	0	0	0	0	0	0	1	0	1	0.5%
International Journal of Electronic Government Research	0	0	0	0	0	0	0	0	1	0	1	0.5%
International Journal of Human-Computer Studies	0	0	2	1	0	1	0	0	0	0	4	2.0%
International Journal of Industrial Organization	0	0	0	0	0	0	0	0	1	0	1	0.5%

Journal name	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Percentage of all journals
International Journal of Information Management	0	0	0	0	1	1	0	0	1	0	3	1.5%
International Journal of Manpower	0	0	0	0	0	1	0	0	0	0	1	0.5%
International Journal of Public Sector Management	0	0	0	0	0	0	0	1	0	0	1	0.5%
Internet Research	0	2	0	0	0	0	0	0	1	0	3	1.5%
Journal of Asian Economics	0	0	1	0	0	0	0	0	0	0	1	0.5%
Journal of Consumer Marketing	0	0	0	1	0	0	1	0	0	0	2	1.0%
Journal of Documentation	0	0	0	0	0	0	0	0	0	1	1	0.5%
Journal of Economic Psychology	0	0	1	0	0	0	0	0	0	0	1	0.5%
Journal of Electronic Commerce Research	0	0	0	0	0	0	0	0	0	1	1	0.5%
Journal of Global Information Technology Management	0	0	2	1	3	3	2	1	0	1	13	6.6%
Journal of Information Technology	0	1	0	1	0	0	0	0	0	0	2	1.0%
Journal of Information Technology	0	0	0	1	0	0	0	0	0	0	1	0.5%
Journal of Information, Communications & Ethics in Society	0	0	0	0	1	0	0	0	2	0	3	1.5%
Journal of Internet Banking and Commerce	0	0	0	0	0	0	1	0	1	0	2	1.0%
Journal of Medical Systems	0	0	0	1	0	0	0	0	0	0	1	0.5%
Journal of Policy Modeling	0	0	0	0	0	0	0	1	0	0	1	0.5%
Journal of Regulatory Economics	0	0	0	0	0	0	0	0	0	1	1	0.5%
Journal of Rural Studies	0	0	1	0	1	0	0	0	0	0	2	1.0%
Journal of Systems and Information Technology	0	0	0	0	0	0	1	0	0	0	1	0.5%
Learning and Instruction	0	0	0	0	0	1	0	0	0	0	1	0.5%
Library Hi Tech	0	0	0	0	1	0	0	0	0	0	1	0.5%
Library Hi Tech News	0	0	0	0	0	0	0	1	0	0	1	0.5%
Library Management	0	0	0	0	0	0	0	0	1	0	1	0.5%
Mobile Networks and Applications	0	0	0	0	0	0	0	1	0	0	1	0.5%
Network Library World	0	0	0	0	2	0	0	0	1	0	3	1.5%
Online Information Review	0	0	0	0	0	1	0	0	0	0	1	0.5%
Poetics	0	0	0	0	0	5	0	0	0	0	5	2.6%
Procedia Social and Behavioral Sciences	0	0	0	0	0	0	0	0	0	2	2	1.0%

Journal name	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	Percentage of all journals
Race & Society	0	1	0	0	0	0	0	0	0	0	1	0.5%
Research Policy	0	0	0	0	0	0	0	0	0	1	1	0.5%
Social Science Research	0	0	0	0	0	0	1	0	0	0	1	0.5%
Technological Forecasting & Social Change	0	0	0	0	0	0	0	0	0	1	1	0.5%
Technology in Society	0	0	1	1	0	1	2	0	0	1	6	3.1%
Telecommunications Policy	1	0	2	3	4	1	4	5	2	1	23	11.7%
Telematics and Informatics	0	0	0	1	2	0	2	3	1	1	10	5.1%
The Electronic Library	0	0	2	1	0	2	1	0	0	0	6	3.1%
The International Information & Library Review	0	0	0	1	2	0	0	0	0	0	3	1.5%
The Journal of Enterprise Information Management	0	0	0	0	1	0	0	0	0	0	1	0.5%
Transforming Government	0	0	0	0	0	0	1	0	0	0	1	0.5%
Yearly Total	1	12	21	16	22	20	22	33	27	22	196	100.0%
Percentage within all journals	0.5%	6.1%	10.7%	8.2%	11.2%	10.2%	11.2%	16.8%	13.8%	11.2%	100.0%	

Appendix 2 Country and geographical region of data collection

Geographical region	Year										Total	Percentage of studies in the region	Percentage of all studies	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010				
Africa														
Single country														
Botswana	0	0	0	1	0	1	0	0	0	0	0	2	14,3%	1,0%
Ghana	0	0	0	0	0	1	0	0	0	0	0	1	7,1%	0,5%
Nigeria	0	0	0	0	0	0	0	1	0	0	0	1	7,1%	0,5%
Uganda	0	0	0	1	1	0	0	0	0	0	0	2	14,3%	1,0%
Zambia	0	0	0	0	1	0	0	0	0	0	0	1	7,1%	0,5%
Total	0	0	0	2	2	2	0	1	0	0	0	7	50,0%	3,4%
Region	0	0	2	1	1	1	0	1	0	1	0	7	50,0%	3,4%
Total	0	0	2	3	3	3	0	2	0	1	1	14	100,0%	6,7%
Asia Pacific														
Single country														
Australia	0	1	0	1	0	0	0	0	1	1	1	4	8,5%	1,9%
Bangladesh	0	0	0	0	0	0	0	0	1	0	0	1	2,1%	0,5%
Cambodia	0	0	0	0	0	0	0	0	1	1	1	2	4,3%	1,0%
China	0	1	0	0	1	1	0	1	0	3	0	7	14,9%	3,4%
India	0	2	2	3	2	0	1	1	1	0	0	12	25,5%	5,8%
Japan	0	0	0	0	0	0	1	1	0	0	0	2	4,3%	1,0%
Korea	0	0	0	0	0	0	1	1	1	1	1	4	8,5%	1,9%
Malaysia	0	0	0	0	0	0	1	0	1	0	0	2	4,3%	1,0%
New Zealand	0	1	1	0	0	0	0	0	0	0	0	2	4,3%	1,0%
Pakistan	0	0	0	0	0	0	0	0	1	0	0	1	2,1%	0,5%
Singapore	0	1	0	0	0	1	2	0	0	0	0	4	8,5%	1,9%
Sri-Lanka	0	0	0	0	0	0	1	0	0	0	0	1	2,1%	0,5%
Taiwan	0	0	0	0	0	0	0	1	0	0	1	2	4,3%	1,0%

Geographical region	2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 Total											Percentage of studies in the region		Percentage of all studies
	0	6	3	4	3	2	7	5	7	7	0	7	44	
Region	0	2	1	0	0	0	0	0	0	0	0	3	6,4%	1,4%
Total	0	8	4	4	3	2	7	5	7	7	7	47	100,0%	22,6%
Canada & USA														
Canada	0	1	1	0	0	0	0	1	0	0	0	3	5,9%	1,4%
USA	1	3	8	5	4	3	7	9	3	5	48	94,1%	23,1%	
Total	1	4	9	5	4	3	7	10	3	5	51	100,0%	24,5%	
Europe														
Single country														
Austria	0	0	0	0	0	0	0	0	0	1	1	2,0%	0,5%	
Belgium	0	0	0	0	1	1	0	0	0	0	1	2,0%	0,5%	
Germany	0	0	1	0	1	1	0	0	0	1	4	8,0%	1,9%	
Greece	0	0	0	0	0	1	0	0	0	0	1	2,0%	0,5%	
Hungary	0	0	0	0	0	0	0	1	0	0	1	2,0%	0,5%	
Italy	0	0	0	0	0	0	0	0	0	1	1	2,0%	0,5%	
Norway	0	2	0	0	0	0	0	0	1	0	3	6,0%	1,4%	
Portugal	0	0	0	0	0	0	0	0	1	0	1	2,0%	0,5%	
Romania	0	0	0	0	0	0	0	0	1	1	2	4,0%	1,0%	
Russia	0	0	0	0	0	0	0	0	0	1	1	2,0%	0,5%	
Spain	0	0	0	0	0	0	1	0	0	0	1	2,0%	0,5%	
Sweden	0	0	0	0	0	0	1	1	0	0	2	4,0%	1,0%	
Switzerland	0	0	0	0	0	0	0	0	0	1	1	2,0%	0,5%	
The Netherlands	0	1	0	0	0	2	0	0	1	0	4	8,0%	1,9%	
Turkey	0	0	0	0	0	0	1	0	0	0	1	2,0%	0,5%	
UK	0	1	1	1	1	2	4	5	2	0	17	34,0%	8,2%	
Total	0	4	2	1	2	7	7	7	6	6	42	84,0%	20,2%	

Geographical region	Percentage of studies in the region											Total	Percentage of all studies	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011			
Region	0	0	0	2	1	1	0	0	4	0	0	8	16,0%	3,8%
Total	0	4	2	3	3	8	7	7	10	6	50	100,0%	24,0%	
Latin America														
Single country														
Chile	0	0	0	0	1	0	0	1	1	0	0	3	37,5%	1,4%
Mexico	0	0	0	0	1	0	0	1	0	0	0	2	25,0%	1,0%
Venezuela	0	0	0	0	0	0	1	0	0	0	0	1	12,5%	0,5%
Total	0	0	0	0	2	0	1	2	1	0	0	6	75,0%	2,9%
Region	0	0	0	0	1	0	0	1	0	0	0	2	25,0%	1,0%
Total	0	0	0	0	3	0	1	3	1	0	0	8	100,0%	3,8%
Middle East														
Single country														
Israel	0	0	0	0	0	1	0	0	0	0	0	1	25,0%	0,5%
Jordan	0	0	0	0	0	0	0	1	1	0	0	2	50,0%	1,0%
Total	0	0	0	0	0	1	0	1	1	0	0	3	75,0%	1,4%
Region	0	0	0	0	0	0	0	0	1	0	0	1	25,0%	0,5%
Total	0	0	0	0	0	1	0	1	2	0	0	4	100,0%	1,9%
Global	0	1	4	1	5	5	3	6	4	5	34	100,0%	16,3%	
Total	1	17	19	13	18	18	25	31	25	23	208	100,0%	100,0%	

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