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Digital exclusion in higher education contexts: A systematic literature review

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Abstract

The integration and adoption of digital technologies have enabled improvements in the quality of and inclusion in higher education. However, a significant proportion of the population has either remained or become digitally excluded. This systematic literature review elucidates the factors underlying the concepts of "digital exclusion" and the "digital divide" in higher education. The identified factors are grouped into three categories: social exclusion (i.e., low income, ICT-avoidance as the norm, lack of motivation and commitment, and physical or mental disability), digital exclusion (i.e., lack of hardware devices and Internet services) and accessibility (which include the division between rural and urban areas, as well as disparities in ICT literacy and information literacy). These factors are multi-tiered and overlapping. Studies on the digital divide, digital exclusion, and barriers to ICT adoption in higher education deal with similar factors, but these are experienced differently in different contexts. While generalizing these factors into categories enables a better understanding of the nature of digital exclusion, solving and circumventing them remains complex due their dependency on the particular context of a higher education institution.

1. Introduction

Information and communication technology (ICT) is present nearly everywhere in our high-end technological and globalized society. There is rapid growth in the adoption of Internet-enabled devices (Barnaghi & Sheth, 2014),

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which facilitate web browsing and allow access to social media and communication across borders. Around the world, these new technologies make it possible for more people to access learning resources for higher education (HE) and contribute to an increase in the number of students completing higher education.

In higher education contexts, ICT is embedded in the form of virtual learning environments (Sims, Vidgen, & Powell, 2008), augmented reality, and virtual reality. In many universities, massively open online courses (MOOCs) and video conferencing systems offer multimodal teaching that transcends time and space. However, the introduction of ICTs has not been beneficial to all. There are people for whom digital technologies result limitations and exclusion from community participation; this process is termed digital exclusion, a concept that is addressed in the European Union's research and innovation program "Platform for ICT for Learning and Inclusion" (European Commission, 2014). This systematic literature review examines which factors constitute the concepts of the *digital divide* and *digital exclusion*. Existing literature offers an understanding of the *barriers to ICT adoption*, also reported as the "barriers to the integration and adoption of educational technologies" (Bingimlas, 2009; Hew & Brush, 2006; Khalid, 2014; Pelgrum, 2001). Presumably, the terms *barriers* and *divide* are related to digital exclusion and refer to the same pattern of factors. However, there is a dearth of evidence and knowledge regarding digital exclusion in the context of HE. Thus, the research question is as follows: Which concepts and interpretations comprise the terms "digital exclusion" and "digital divide" in higher education contexts?

The paper contains three main sections. First, the data collection and analysis methods are presented. Second, the selected articles are categorized and analyzed according to the country of empirical investigation. Third, the factors underlying concepts of the "digital divide" and "digital exclusion" are analyzed.

2. Methodology

The selection of articles was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Moher, Liberati, Tetzlaff, & Altman, 2009), which includes four phases: identification, screening, eligibility, and included (See Fig. 1.).
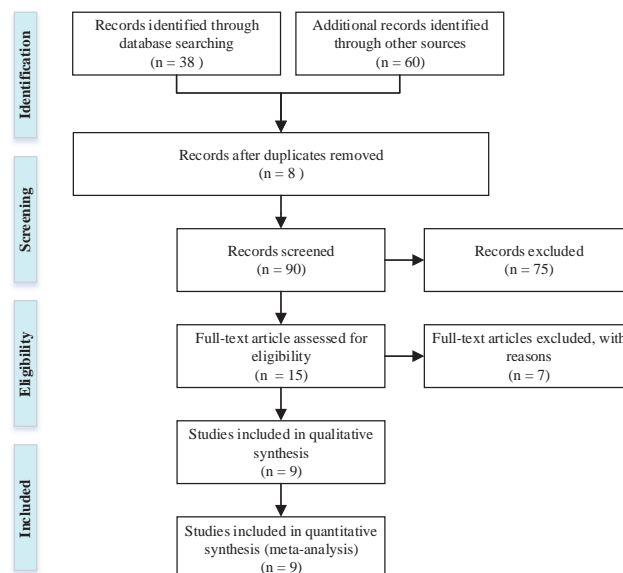

Fig. 1. PRISMA Flow Diagram (Moher et al., 2009)

First, using EBSCOhost, two databases, Academic Search Premier and ERIC, were searched; these were selected because they cover a wide spectrum of articles related to HE. Both abstracts and full texts were searched with different combinations of the keywords "higher education," "university," "college," "digital exclusion," and "digital

divide," resulting in 376 matches. A subsequent search of full-text and peer-reviewed papers returned 185 articles. Restricting the interval to 2005-2015 returned 38 articles, and 30 papers remained after the removal of duplicates. In the first round of screening, articles were rejected if they did not have at least two of the terms in the title or keywords. The second round of screening was conducted through a quick reading of the abstract in order to identify synonymous words and to find relevance that was not considered earlier. Subsequently, seven articles were selected for full-text screening.

The second iteration of selection was conducted in Google Scholar using the search string "higher education" + "digital exclusion" + "digital divide" and within the same time interval of 2005-2015. The search returned 359 records, which we ranked by relevance; the first 60 records were screened. After screening the titles and abstracts, eight articles were selected for full-text screening. Five of these articles were from the Taylor and Francis database, and the remaining three were from different open-access databases.

During the two iterations of the selection process, a total of 90 (that is, 60 and 30) titles and abstracts were screened. During the full-text eligibility assessment phase, seven articles came from EBSCOhost, and eight were from Google Scholar. The articles that did not contribute to understanding the nature of digital exclusion and the digital divide in HE contexts were excluded.

Finally, nine papers were included for qualitative synthesis and meta-analysis through categorization according to the country of the HE context. The constant comparative method (Hewitt-Taylor, 2001) was applied to qualitatively analyze and synthesize these articles.

3. Qualitative Analysis According to Country

3.1. Overview of the Articles

The articles cover experience and evidence of digital exclusion and the digital divide in the HE contexts of both developing and developed countries. The distribution of papers is as follows: three on South Africa, three about England (on four different universities), one on Spain, one on Indonesia, and one on the United States of America. Two articles were published in the journal *International Review of Research in Open and Distance Learning*. The rest were published by the *South African Journal of Libraries and Information Science*, *Telecommunications*, *GeoJournal,* and *Sociological Viewpoints*. The composition of different research fields indicates that this is a complex and interdisciplinary research area. The research articles are intended primarily for researchers and teachers in their respective disciplines and national contexts. Most of the research articles use large-scale collection of primarily quantitative data, supplemented with qualitative data collected through interviews. Few are based solely on qualitative studies. The articles are presented below according to their national contexts.

3.2. South Africa

Naidoo and Raju (2012) examined why South African (SA) students at Durban University of Technology (DUT) find it difficult to attend university courses on information literacy. The authors found that students in this program varied significantly in their ICT competencies, which was due to the *difference in access* and *experience with the use of computers and the Internet*.

Liebenberg, Chetty, and Prinsloo (2012) conducted a quantitative study where students were divided into online and paper response groups. They argue and demonstrate that it is misguiding to separate the digital divide into those that "do have" and "do not have" access to a computer, i.e. own a PC or not. "Evident from this research, students who are active on myUnisa and who completed the survey online have regular access to ICTs for educational purposes (91%). Contrary to popular belief that students participating online have access to the Internet, 9% of these students indicated that they do not have regular access to ICTs. " (2012, p. 263) A correlation exists between the degree of accessibility and experience with computers and the Internet. The online group clearly had more experience and was more likely to have access to computers and the Internet either at home or at work than the paper response group.

Brown & Czerniewicz (2010) identified that those who are socially disadvantaged are more likely to be digitally excluded. They raised doubts about the utility of the term "digital native," as their study shows there is no empirical support for the concept. "A serious problem with the concept of the 'digital native' is that it is an analog one implying either/or binaries rather than a continuum" (Brown & Czerniewicz, 2010, p. 366). They suggested that the reconceptualization of the terms "native," "net," and "digital" will be valuable. One anecdote illuminates the social reliance on ICT: "Almost two-thirds (65%) have a high social use of ICTs, for some this being a priority: '*I enjoy it not for learning as it is complicated and boring, but for socializing with friends, being updated with the latest sports news and viewing the latest pictures of items and video clips of them*' [Digital Native (S2-I-2816)]" (Brown & Czerniewicz, 2010, p. 363).

3.3. England

Lane (2009) discussed the impact of openness (i.e., open educational resources (OER) and access) on bridging the educational digital divide. Openness, in this case, refers to open universities and how the importance of these have emerged with the adoption of ICTs in educational institutions. The article points out that the uses of ICT in e-learning contexts transcend time and space, in addition to being free of costs and requiring no further qualifications. However, OER in itself does not address the challenges of socially excluded groups, either physically or psychologically. This demographic does not feel qualified to complete this type of education. Socio-economic challenges are also evident, and some cannot afford the technologies required to access OER. However, Lane does not consider this to be the biggest challenge in the long term (Lane, 2009, p. 6). A greater threat is that socially excluded groups often lack "digital literacy," which impacts their ability to navigate and participate in society. Lane's point is that without sufficient digital skills, this group has very limited freedom to engage in open learning contexts.

Warren (2007, p. 376) argued that broadband access depends on geography, thus leaving populations in rural areas at a disadvantage in most countries. Referencing Castells, Warren's thesis is that the massive transition to exclusively digital communication together with the aforementioned geographical challenge affects an individual's right to education (2007, p. 377). Thus, a new factor expanding the digital divide is broadband Internet, which makes larger file transfers, playing videos, and interactive communication faster than when using a dial-up connection via a modem through the telephone network.

Sims et al. (2008) emphasize two main criticisms against e-learning, which is touted as a means for greater participation in higher education. The first is access to technology, and the second is the appropriateness of e-learning as means to include a population traditionally excluded from higher education. With the current approach in HE and without concrete initiatives to overcome the digital divide, the socio-economic, cultural, ethnic, and gender gaps will only grow (Sims et al., 2008). One of the most obvious barriers to learning is the expense. The authors dispute the assumption that the use of learning technology reduces the barriers of time and space, and they examine whether learning technologies and ICT are being used to expand the number of "non-traditional students" in HE. A non-traditional student is defined as a student from a vulnerable population, and in that definition they point out a biased, elitist division of who participates in higher education. Research suggests that the use of ICT and its benefits (e.g., the access independent of time and space) is not beneficial to digitally and socially excluded groups of students. Technology may even result in or increase the inequalities that already exist (Gorard, Selwyn, & Williams, 2000). Like Warren (2007), the authors also note that access to broadband is of increasing importance because of larger file transfers, among other things (Sims et al., 2008).

3.4. Spain

Ricoy, Feliz, and Couto (2013, p. 267) concluded that the majority of their respondents (Spanish first-year students) own several ICT devices and have no difficulty using them for academic as well as private purposes. However, there is a small group who cannot afford to acquire ICTs and a second group lacking digital expertise. The study does not report whether there is a connection between the two.

3.5. Indonesia

Rye (2008) examined students taking part in a distance master's program involving both face-to-face teaching and online tutorials. The study was based on variations in the Internet connection in peripheral and in metropolitan areas and how this difference affects students' motivation to use ICT. The qualitative study showed a significant difference in the use of ICT and Internet access depending on whether students lived on the island of Bangka Belitung (considered a peripheral area) or in the capital, Jakarta. Rye concluded that students who live in rural districts have not had the advantage of Internet-supported education, as opposed to those living in the big city. However, the offer of participation in distance education seems to help boost regional development in remote areas of Bangka Belitung.

3.6. The United States of America

Madigan and Goodfellow (2005) investigated to what extent digital access for first-year college students is influenced by their parents' education level and family income. They identified and selected a set of independent variables from literature on the digital divide to compare with dependent variables. The goal of the study was to determine how family income, parents' education, gender, and race/ethnicity influence computer and Internet access at home, in public, and elsewhere. The study shows a significant correlation between family income, educational level of the father, race, and the probability of having a home computer and Internet access. Race inequities were apparent in Madigan & Goodfellow's (2005) study: "*only 10% of black students had a home computer access. White respondents were 1.441 times more likely to have home computer access than non-white respondents*" (p. 57).

Another interesting variable is the mother's education, or rather its lack of impact on the probability of digital access. Madigan & Goodfellow (2005) stressed that this as an issue that must to be taken seriously given the increase in single-parent households headed by women. They pointed to a study conducted by the U.S. Department of Commerce (2004) that showed lower Internet access in single-parent households and suggested that mothers need to become *technological role-models* for their children.

4. Qualitative Analysis According to Themes

4.1. Digital Exclusion and Digital Divide

Digital exclusion points to the group of people on the negative side of the so-called "digital divide," line, i.e., those who are deprived of digital developments. The digital divide is a disputed concept; it has been subjected to simplification over time and basically reduced to a question of owning or not owning, i.e. a divisions between those who can or cannot afford a computer (Liebenberg et al., 2012). It is widely agreed that the digital divide is about *accessibility*. This notion is also very broad but basically refers to whether an individual has full, unrestricted access ICTs; therein lies an implicit understanding that there must be access to computers and the Internet at home (Madigan & Goodfellow, 2005; Sims et al., 2008). The digital divide refers to the gap between those who have access to new information technologies, the information "haves," and those who do not have access, the information "have-nots" (Clark, 2003, p. 663). Furthermore, Madigan and Goodfellow (2005) firmly conclude that "access must come first before literacy can be addressed" (p. 59). With the rapid technological developments that have taken place over the past 10 years, several researchers have discussed, criticized, and attempted to broaden what the digital divide includes (Rye, 2008). It is evident that both "digital exclusion" and the "digital divide," whether in the context of higher education or not, include similar factors but differ in the intensity of the barriers experienced between rural and urban areas.

The reviewed articles define the digital divide as follows: "The digital divide refers to the gap that exists between those with ready access to information and communication technology (ICT) tools and those without such access or skills to enable access" (Naidoo & Raju, 2012, p. 34), and "[t]he 'digital divide' is commonly related to differences in access to the new digital technology and in variations regarding access to information and knowledge shared in locally and globally distributed digital communication channels" (Rye, 2008, p. 172).

Warren states that digital exclusion describes "a situation where a discrete sector of the population suffers significant and possibly indefinite lags in its adoption of ICT through circumstances beyond its immediate control" (2007, p. 375).

4.2. Social Exclusion

Socially vulnerable groups are digitally excluded, regardless of which country they come from (Brown & Czerniewicz, 2010; Lane, 2009; Warren, 2007). There is a "vicious cycle" between social exclusion and digital exclusion: "[s]ocial exclusion leads to digital exclusion, which in turn perpetuates and exacerbates that social exclusion" (Warren, 2007, p. 379). One of the indicators of social exclusion is that the most vulnerable social groups demonstrate the lowest use of ICTs (Sims et al., 2008). The underlying causes of social exclusion can be one or more of the following: "income deprivation, social deprivation including poor education or health, disengagement and marginalization (i.e. withdrawal and rejection), and local services: public and private, infrastructure" (Warren, 2007, p. 378), low income, low motivation, and an accepted norm that ICT is not necessary (Sims et al., 2008). This is true within both developed and developing countries, including South Africa (Brown & Czerniewicz, 2010; Naidoo & Raju, 2012), Indonesia (Rye, 2008), Spain (Ricoy et al., 2013), England (Lane, 2009; Warren, 2007) and the USA (Madigan & Goodfellow, 2005).

Despite the effectiveness of ICTs, a significant part of England's population is at risk of being socially and digitally excluded, as they are unable to use or access the Internet due to one or more of the following factors: 1. insufficient funds to provide computer hardware and pay for Internet access, 2. lack of engagement (including pathological inability), confidence, understanding and/or motivation (and limited opportunities to remedy this), 3. no opportunity for public Internet access due to distance combined with lack of transport or lack of physical mobility, 4. inability to interact with the information due to dyslexia, language, or cultural barriers, and 5. inability to make direct use of computer equipment due to physical (including visual) or mental disabilities (Warren, 2007, pp. 282–283). The first three factors are characteristic of digital exclusion and are referred to in the vast majority of articles reviewed (Lane, 2009; Naidoo & Raju, 2012; Sims et al., 2008). This gives a clear indication that it is possible to generalize or at least categorize the causes underlying digital exclusion.

4.3. Accessibility

Inaccessibility can result from a lack of ICT affordability and therefore ownership, authority or the right to use a device or service (e.g., the Internet), and many others. In Europe, access to digital devices or Internet service is no longer a major challenge, as these have become common property in recent years in most Western countries (Rye, 2008). Accessibility can also be related to the sufficiency of Internet bandwidth required for different types of communication by social groups (Rye, 2008; Sims et al., 2008). In developing countries, to a greater extent, accessibility refers to whether people have access to the Internet without major obstacles. In South Africa, some students only have access to the Internet via a third party, for example, Internet cafes, neighbors, or libraries (Brown & Czerniewicz, 2010). Furthermore, Internet service costs and shortages of providers in remote areas can also be exclusion factors in both developed and developing countries (Madigan & Goodfellow, 2005; Rye, 2008).

However, for the most part, issues of accessibility in developed and developing contexts are different. In a developed country it is more typical to own a computer and have Internet service at home than it is in developing countries. The lack of access to a computer and the Internet in a developed country is most likely due to low income or a deliberate rejection of ICTs in the home (Sims et al., 2008). Furthermore, the quality of Internet connectivity in the two contexts is also different (Rye, 2008; Sims et al., 2008). There is evidence that access to high-speed Internet at home is essential for one's abilities to use the Internet (Liebenberg et al., 2012; Madigan & Goodfellow, 2005; Rye, 2008). In higher education, greater ICT use has become a prerequisite. Thus, there has to be some degree of ICT accessibility and competence in order to adapt to higher education contexts. There is also an overall correlation between greater use of the Internet and higher education and higher income (Lane, 2009; Madigan & Goodfellow, 2005; Ricoy et al., 2013; Sims et al., 2008). This means that people from lower income groups are less likely to be prepared for and have experience in Internet use and, in turn, e-learning contexts.

4.3.1. Rural Versus Urban

Some articles suggest that those who live in rural areas are more vulnerable to digital exclusion than residents of urban areas (Rye, 2008; Warren, 2007). Public access points, transportation, and distance are interdependent factors in developed countries (Warren, 2007). The same is true in developing countries such as Indonesia and South Africa (Naidoo & Raju, 2012; Rye, 2008). This challenge is also seen in the U.S. where rural areas have less Internet access than urban areas. There are a number of underlying reasons for this, including the correlation between a lower subscriber base and higher costs of building and maintaining the necessary infrastructure (Madigan & Goodfellow, 2005).

4.3.2. ICT Literacy and Information Literacy

The lack of ICT literacy, or the lack of knowledge and skills, depends on what type of challenges students, teachers, and other members of higher education institutions encounter based on where they come from. In developing countries, for instance, "[t]he provision of inadequate resources at many secondary schools in South Africa has resulted in under-prepared students arriving at HE institutions. They have little or no ICT experience, which impacts on their participation in [information literacy] IL classrooms, thereby contributing to the digital divide" (Naidoo & Raju, 2012, p. 42). There are also fewer computers in the homes of residents of developing countries, and thus people living in these countries largely have less experience with computers and the Internet. This problem is not as acute in developed countries (Warren, 2007), but it is still faced by those who cannot afford to acquire ICTs (Ricoy et al., 2013). It is therefore not surprising that a group lacking technological skills also lacks the know-how to effectively use the Internet.

5. Discussion and Conclusion

This systematic literature review elucidates the factors underlying the concepts of "digital exclusion" and the "digital divide" in the context of higher education. The identified factors are grouped into three categories: social exclusion (i.e., low income, ICT-avoidance as the norm, lack of motivation and commitment, and physical or mental disability), digital exclusion (i.e., lack of hardware devices and Internet services) and accessibility (which include the division between rural and urban areas, as well as disparities in ICT literacy and information literacy). There are multi-tiered and overlapping factors within and across these categories. It is possible to generalize or devise a pattern for some of these factors, irrespective of whether they occur in a developed or developing country, or in a rural or urban context. At the same time, some the factors represent the characteristics of the rural and urban context. For instance, even in a highly digitized developed country, some people are socially excluded due to a lack of digital skills, ownership, or other factors that also exist in developing countries. Infrastructure is a major barrier in the rural context irrespective of whether it is in a developed or developing country. There is a vicious cycle between digital exclusion and social exclusion.

The digital divide and digital exclusion are multi-tiered challenges or barriers, which are not limited to the dichotomy of the "haves" and "have-nots" in the context of higher education. It can be concluded that the causes of digital exclusion vary significantly, but there are some key factors in common. At the individual level, people may have limited experience, a lack of skills, or a lack of motivation to use ICTs. Socio-economic challenges disproportionately affect the most vulnerable in society; lower education leads to lower earnings, which lead to lower affordability and use of ICTs and result in limited ICT experience. In England, there is a clear indication that the higher a family's income and the father's education level are, the greater the use of ICTs. There is a similar trend in South Africa and Spain. There are rural-urban differences in digital exclusion regardless of nationality; related factors include poor bandwidth and infrastructure. Digital exclusion must be understood in individual contexts, and to reduce the digital divide, it is necessary to understand community-related aspects. Differences in the intensity of factors that occur in different contexts (rural versus urban and developing versus developed) can be categorized as follows: 1. the dependency between factors, 2. the quality dimension of the factor (e.g., level of ICT skills), and 3. the proportion of the population, institution, or area that is excluded or vulnerable to exclusion.

It is evident that studies on the digital divide, digital exclusion, and barriers to ICT adoption in higher education deal with the same factors, but these are experienced differently in the different contexts. Khalid and Buus (2014)

reviewed the categorization of barriers to the adoption and integration of ICT in education and found that the same factors that lead to digital exclusion in HE can also be categorized according to 1. the individual (micro-), institutional (meso-), and national (macro-) level of the education system and the education system's external factors, 2. extrinsic, or first-order, and intrinsic, or second-order, exclusion, 3. material and non-material exclusion, 4. direct and indirect exclusion, and 5. teacher-level exclusion and institution-level exclusion. Such categories enable a better understanding of the nature of digital exclusion. While the synthesis and generalization of these factors into the categories provided here enable a better understanding of the nature of digital exclusion, the process of solving and circumventing this problem remains complex due the dependency of these factors on the particular contexts of higher education institutions.

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