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Gender Digital Divide and Online Participation: A Cross-national Analysis¹

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Abstract

To achieve the information society for all, access for all is crucial. However, many countries have reported to have large gender discrepancies in online access and participation. This study empirically verified user perception data and compared the data across countries and genders to determine the differences between countries and genders. The results of surveys in Cambodia, Iran, and Korea verify that each aspect of the digital divide and online participation has a different influence on each aspect of digital access and online participation between the genders in each country. In this study, we propose measurement items of digital access and user participation in the online context. This paper also offers guidelines for online policy and business strategy for targeting users with different levels of digital access.

Keyword: Digital Divide, Gender Digital Divide, Access, Online Participation, Cross-national

1. Introduction

The information society is evolving rapidly with the advent of new information and communication technology (ICT). Millions of people go on the Internet, not only to search information but also to share their information and interact with other people. In this “information society for all,” access itself is believed to be an important opportunity, so access for all is considered crucial; people regardless of their different nationality, social class, education, age, and gender become able to access computers and Internet connections and to participate in the information society (van Dijk, 2006). Among various aspects of the digital divide, the gender inequality of ICT is an important subject as part of the expansion of interest in enhancing the satisfaction of a woman’s life, rights, and social well-being (Huyer, 2005).

In recent years, more developing Asian countries are leading technological and business innovation in the ICT industry and more and more Internet users in these countries access the Internet and participate in online activities. Yet, the continuous changes in technology may be accelerating the inequality of ICT access in the region and widen the digital divide among people. In particular, certain regions in Asia, such as South Asia and the Middle East, are reported to have a relatively high gender digital divide in addition to the large gender discrepancies in education and social status (Klasen, 2002).

Many previous studies and reports have investigated the actual digital divide in the world, but few studies have empirically looked into users’ perceptions on their online access status and online participation. As successive kinds access to digital technologies are not only based on the actual level of access but also on the perceived level of access (especially motivational access), there is a need to examine user perception of digital access. Moreover, little is known about the level of gender discrepancies of online access and participation, particularly in some countries in Asia, where gender inequality has been reported to be substantial.

Thus, this study explores the gender digital divide and compares the data from three Asian countries with different characteristics: Cambodia, Buddhist country with low economic and ICT development; Iran, an Islamic country with medium economic and ICT development; and South Korea, a Confucianist country with high economic and ICT development (UNDP, 2010; ITU, 2007; World Bank, 2010).

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The aim of this study was four-fold: 1) To verify the measurement items for testing digital access and user participation in online services through the Exploratory Factor Analysis (EFA) 2) To empirically investigate the different aspects of the digital divide suggested by Chen & Wellman (2003) and van Dijk (2003) and user online participation 3) For an empirical investigation, to develop instruments for each kind of access by reviewing items from previous studies, 4) Finally, to compare the data among three countries with different ICT development statuses and between genders to better understand the gender digital divide.

This paper is organized as follows. First, we review the literature on the digital divide and various levels of ICT access. Based on the literature review, we develop measurement items for digital access and participation. In the next section we empirically check the differences of digital access and online participation. A research method is then proposed, including measurement items, sample and data characteristics, and data collection and analysis methods. Then, we analyze the research model empirically and compare it across genders and countries. Finally, our discussion section covers findings, academic and practical implications, and limitations of this study.

2. Literature Review

2.1 Digital Divide

At first glance, information and communication technology (ICT) seems neutral with respect to gender, race, location, and socioeconomic status, but in reality, some people, in terms of ICT, are disadvantaged. The concept of the digital divide is aimed at this issue and the people group. The digital divide is defined as "the gap between individuals, households, businesses, and geographic areas at different socio-economic levels with regard both to their opportunities to access ICTs and to their use of the Internet for a wide variety of activities (OECD 2001)." According to a center-periphery order, there are large inequalities in skills, resources, and infrastructure between rich and poor countries in the matter of ICT (Chen & Wellman, 2004). The digital divide at the national and international levels shows pre-existing social, economic, political, and cultural inequalities. Nowadays, our personal and professional life is increasingly influenced by ICT. The more ICT becomes essential, the more the digital divide will produce and re-produce inequality.

2.2 Different aspects of Digital Access

In the first attempts to define and measure the digital divide; researchers focused on physical access, which is the possession of a personal computer (PC) and Internet connection. Van Dijk (2006) defined physical access as a "personal computer and internet among demographical categories that are obvious in this respect: income, education, age, sex, and ethnicity." Chen and Wellman (2003) referred to this concept as different levels in terms of using different hardware, software, and bandwidth. These differences can affect efficiency and diversity of use.

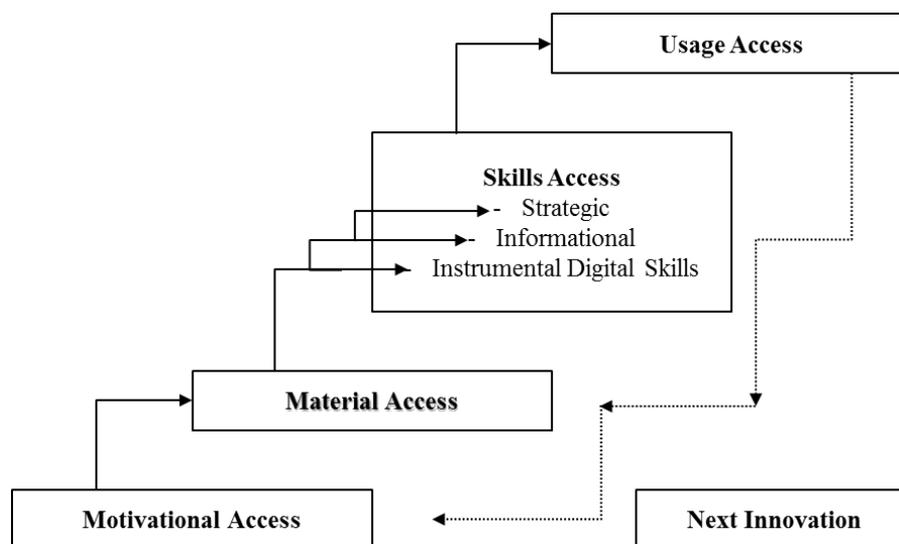
Among many factors affecting physical access to digital technology, income is one of the most important demographic factors at both national and international levels of physical access of digital technology. Countries, groups and individuals with high incomes have a high rank in physical access (Dewan, Ganley & Kreamer, 2005; Cuervo & Mene'ndez, 2006; Ono & Zavodny, 2007; Chen & Wellman, 2003; Chinn & Fairlie, 2007). Race (Bosman, 2005; Khan & Ghadially, 2010), education (Ono & Zavodny, 2007), sex (Khan & Ghadially, 2010; Chen & Wellman, 2004), and age (Vandenbroek, verschelden & Boonaert, 2008; Chen & Wellman, 2004) are other demographical factors that can affect physical access.

Although ICT penetration has increased, physical access is still essential. In developed countries, around 65.6% of households have access to the Internet, while, in developing countries, this rate is 15.8% (ITU, 2010). In many countries and groups many people did not have access to earlier forms of ICT, such as TVs and telephones. Through one qualitative investigation in Cambodia, Wijers (2010) found that a significant lack of ICT infrastructure in Cambodia is not easy to fix. Natural and geographical limitation exacerbates this problem. In spite of overall IT development, new users are demographically similar to old users and disadvantaged people are still marginalized (Chen & Wellman, 2003; Husing & Selhofer, 2004).

Though access itself is usually defined as being allowed to go into something, and is equated with physical access, this narrow definition is limited for fully understanding digital access. Accordingly studies have categorized various types of access. Van Dijk (2005) suggested a cumulative and recursive model of successive kinds of access to digital technologies proposing four different types of access to be taken by individual users for the total process of appropriation of digital technology: motivational access, material access, skills access,

and usage access <Figure 1>. In his model, the successive influence of each level of access finally affects the usage of digital technology. Chen and Wellman (2003) examined four perspectives of the digital divide: technological access, technological literacy, social access, and social use. Mossberg et al. (2003) and Dewan and Riggins (2005) categorized the digital divide by five different types: the information divide, the skills divide, the economic opportunity divide, the demographic divide, and the e-commerce divide.

Figure 1. Acumulative and Recursive Model of Successive Kinds of Access to Digital Technology. Source: van Dijk (2006)



Taken together, access in the digital divide can be categorized by four types: motivational access, material access, skills access, social access. These four types of access alone or together influence actual usage. Motivational access is a sufficient level of motivation of potential users to try to use the digital technology. This level of access is closely related to interest in or need of the technology. Material access is more about physical access to the technology. It is access to the basic material needed for actual access; for example, hardware, software, infrastructure, etc. Skills access is the level of skills needed to deal with the digital technologies (van Deursen et al., 2006). Finally, social access is the overall social conditions that affect access to the Internet, such as affordability, language, and content (Chen and Wellman, 2003).

2.2.1 Motivational access

Prior to physical access, people need to have a wish to be connected to the Internet. This wish to be connected to the web and participate in online activities is motivational access to technology. Research has shown non-users come not only from the ‘have-nots’ but also from the ‘want-nots’, people who refuse to get connected to the Internet and participate online activities (van Dijk, 2006). A primary explanation of this ‘want-nots’ phenomenon is that the Internet does not have appeal for some people due to several reasons: for example, the utility is lower than its costs so it is not very useful or it is too difficult to use (Katz and Rice, 2002). These mental and psychological explanations for the ‘want-nots’ are connected to general mental precedence of technology acceptance, so according to the independent factors of the technology acceptance model (TAM), the motivational access factor is a second-order factor. Three factors from the TAM are included in the motivational access factor as first-order factors: perceived usefulness is the extent to which a user finds the Internet useful; perceived ease of use is the extent to which a user finds it easy and comfortable to learn and use the Internet; perceived enjoyment is the extent to which a user finds it fun to use the Internet (Davis, 1989; Venkatesh and Brown, 2001; van der Heijen, 2004). In this study, motivational access, which consists of perceived usefulness, perceived ease of use, and perceived enjoyment, is a factor that positively affects the someone’s accessibility to use the Internet.

2.2.2 Technology access

The divides of material access, which is often called physical access or technological access, have been studied in a large number of digital divide studies. Among the different demographical categories in this level of access, there are obvious different levels and combinations of technologies needed to be connected to the

Internet. To be able to use the Internet, there should be a certain ICT infrastructure, hardware, software, and bandwidth. The level of those technological elements may affect the efficiency and the volume of Internet use. Connections to the Internet through a 56 K dial-up modem and a high-speed broadband are totally different experiences (Chen and Wellman, 2003, van Dijk, 2006).

2.2.3 Skills access

Having the ability to use the Internet effectively is another aspect of the digital divide (van Deursen and van Dijk, 2010). The skills to use the Internet meaningfully require the ability to manage the computer and the Internet. In the digital divide, skills access encompasses the problems related to computers, information or multimedia literacy, information capital, and technological literacy. When people think they are not able to control the Internet, they may not be willing to use the Internet, which creates problems such as computer anxiety. In this study, we considered perceived skills access rather than absolute ability. Accordingly, we brought the concept of perceived self-efficacy into the skills access construct. A general definition of perceived self-efficacy is people's beliefs in their ability to perform a certain task well and control events that affect their behavior (Bandura, 1997). Self-efficacy has been verified to have influence on behavioral intention in the theory of planned behavior (TPB). Ajzen (2002) established that self-efficacy and controllability are the key components that comprise perceived behavioral control. In addition, according to the self-evaluation theory, a higher self-efficacy is a crucial factor affecting behavioral intention (Kernis and Waschull, 1995).

2.2.4 Social access

Social access is economic, organizational, and cultural factors affecting access to the Internet. This is social background or support that is related to actual Internet usage which is the final stage of the access given above. As the Internet has become a medium of the masses, the usage of the Internet can be better understood by identifying its features associated with social access. Chen and Wellman (2003) proposed that affordability, awareness, language, and usability of contents are included in social access. In this study, we especially limited this construct to the perceived content availability in a society. Hence, we included the idea of whether users believe that there is affordable, sufficient, and available online content in a society. The social background of content availability in terms of cost, number, language, and usability has been studied as including important factors that affect behavioral intention to use the Internet (Lin and Lu, 2000). If there is more available content, people may feel more willing to participate in use of the Internet.

2.3 Online Participation

Behavioral intention has been studied as one of the most critical factors that positively affect actual behavior. In the area of Internet use and online participation, participation intention, which is defined as the extent to which an individual intends to be connected to the Internet, use the Internet, and exchange their feelings and opinions online, is verified to definitely influence actual online participation (Joinson, 2008). In this study, participation means any general use of the Internet from surfing online or finding information to joining social network services or writing opinions on a web board.

2.4 Gender Digital Divide

Gender inequality is one of the critical issues, especially in developing countries. Gender inequality refers to unequal opportunity between men and women in social, political, economic, and cultural contexts. Gender inequality and the gender digital divide are related. Ono and Zavodny (2007) found the gender digital divide in countries with a higher level of gender inequality is high. If women have physical access and sufficient skills, they will connect to digital space (Cooper, 2006). Via Information Communication Technology (ICT), women can inform themselves about their rights and connect to supportive networks (Huyer, 2005). Women can use ICT as an empowerment tool, which can lead to gender equality (Khan & Ghadially, 2010). However, women are on the wrong side of the digital divide. Women started using ICT later than men (Ono & Zavodny, 2007). Physical access and usage access of women are lower than that of men (Huyer, 2005). They are less likely to be experienced in creating web documents, installing software, and writing computer programs (Husing & Selhofer, 2004).

2.5 ICT and Human Development Status of Target Countries in the Study

Our analysis focused on the digital divide, the gender digital divide, and online participation among the Islamic Republic of Iran, the Kingdom of Cambodia, and the Republic of Korea. These countries have different levels of development. They are located in different areas and they have distinctly different cultures. Table 1 compares these countries in terms of their ICT development ranking, human development ranking, and gender inequality index. All the values in the table are in terms of the ranking in the world. In comparison with most of the previous studies that used pre-existing data, our investigation is an empirical study and we used surveys as a research method. Few research investigations have empirically studied the digital divide to this extent or used a multinational context.

Table 1. Comparison of Target Countries in the Study (World Ranking)

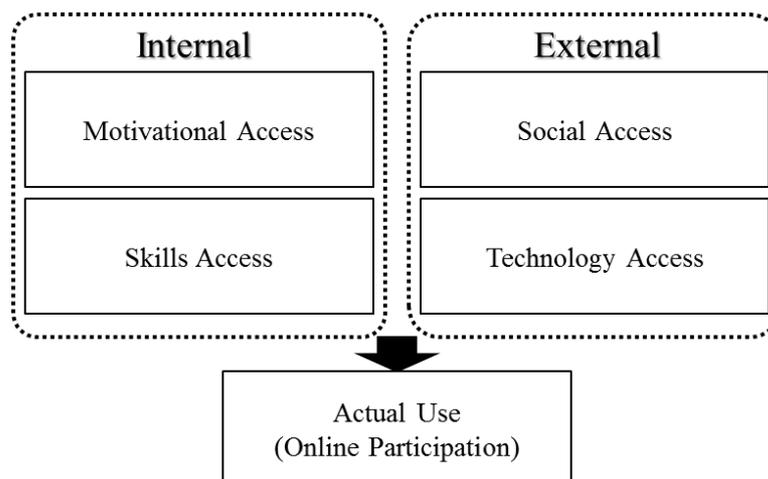
| Index | Cambodia | Iran | Korea (South) |
|--|-------------------|------------------|------------------|
| ICT Development Index 2008 (IDI) (ITU, 2010) | 120 th | 84 th | 3 th |
| IDI Access sub index 2008 (ITU, 2010) | 118 th | 83 th | 14 th |
| IDI Skills sub index 2008 (ITU, 2010) | 121 th | 91 th | 1 st |
| IDI use sub index 2008 (ITU, 2010) | 145 th | 76 th | 2 nd |
| Human Development Index 2010 (HDI, 2010) | 124 th | 70 th | 12 th |
| Gender Inequality Index 2008 (HDI, 2010) | 95 th | 98 th | 20 th |

3. Research Methodology

3.1 Research Framework

This study adopts concept of digital access from Chen and Wellman (2003) and van Dijk(2006). This framework consists of two different part of digital access: internal and external access. Internal access refers to person’s perception about their motivation and skill of ICT system and service usage. External access refers to person’s external condition to use ICT system and service. When people think their society provide internal and external access for them, then they are going to use the Internet as well as use ICT system and service. Figure 2 shows our research framework and the study compares three different countries, genders of the digital access and online participation.

Figure 2. Research framework. Source: retrieved from Chen and Wellman (2003), van Dijk (2006)



3.2 Statistical Analysis

Descriptive statistics were conducted for checking the demographic and respondents’ characteristics of three countries. An exploratory factor analysis (EFA) was conducted to extract the components of our measurement items and verify that our measurement items were well organized. An analysis of variance (ANOVA) was also

conducted, comparing digital access and online participation. To compare the gender digital divide between male and female, we used t-tests. SPSS version 18 was used for all the procedures.

3.3 Measurement Instrument

Most of the measurement items for this study were adopted from the previous literatures of digital access, divide and online participation as well. In order to conduct the survey, we used the 7-point Likert scale, ranging from “1: Strongly disagree” to “7: Strongly Agree.” The final items we used are displayed in Table 2.

Table 2. Measurement Items

| Item | | Source |
|----------------------------------|--|---|
| Motivational Access [MA] | | |
| MA1 | Learning to use the Internet would be easy for me. | Davis (1989), Venkatesh and Brown (2001), van der Heijen (2004), van Dijk(2006) |
| MA2 | I would find it easy to use the Internet to do what I want to do. | |
| MA3 | It would be easy for me to become skillful at using the Internet. | |
| MA4 | I would find the Internet easy to use. | |
| MA5 | Using the Internet improves my study or work performance. | |
| MA6 | I find the Internet useful for my work. | |
| MA7 | Using the Internet enhances my effectiveness in my study or work. | |
| MA8 | Using the Internet provides me with information that would lead to better decisions. | |
| MA9 | I would find using the Internet to be enjoyable. | |
| MA10 | I would find using the Internet to be pleasant. | |
| MA11 | I would have fun using the Internet. | |
| MA12 | I would find using the Internet to be exciting. | |
| Social Access [SA] | | |
| SA1 | I think that I can afford to use online Internet content. | Chen and Wellman (2003), van Dijk(2006), |
| SA2 | I think that there is much online Internet content that I am interested in. | |
| SA3 | I think that there is much available Cambodian content on the Internet. | |
| SA4 | I think that there is much online Internet content available for me. | |
| Skills Access [SKA] | | |
| SKA1 | I feel confident in understanding terms related to computer | van Dijk(2006), Bandura (1997), Ajzen (2002) |
| SKA2 | I feel confident in understanding terms related to Internet programs | |
| SKA3 | I feel confident in troubleshooting basic Internet problems | |
| SKA4 | I feel confident in using the Internet to gather information | |
| Technology Access [TA] | | |
| TA1 | ICT infrastructure: I think the ICT infrastructure of my country is good. | Chen and Wellman (2003), van Dijk(2006), |
| TA2 | Hardware: I think that I can easily buy the computer hardware in my country. | |
| TA3 | Software: I think that I can easily buy or download software in my country. | |
| TA4 | Bandwidth: I'm satisfied with the overall the Internet speed of my country. | |
| Online Participation [OP] | | |
| OP1 | I am willing to participate in online activities. | Joinson (2008), van Dijk(2006) |
| OP2 | I am willing to write on online sites. | |
| OP3 | I am willing to share some information online. | |

3.4 Sample & Descriptive Statistics

The survey method was conducted to test the hypotheses for our model. We collected samples from the university students in Cambodia, Iran, and Korea. Before we distributed the full scale survey, we conducted a pilot survey to check and revise the measurement items of the study. In Cambodia and Iran, we distributed a paper survey to undergraduate and graduate students in Cambodian Mekong University (Phnom Pehn) and Isfahan University (Isfahan), respectively. For the samples from Korea, we used an online survey for university students in Korea through an online panel company. We collected all three countries samples from July to September 2011 and a total of 896 students participated.

Table 3 presents the demographic characteristics of the respondents. The respondents from Cambodia were composed of 132 males (45.8%) and 156 females (54.2%). Most of them were undergraduate students and all of them were using computers and the Internet. The respondents from Iran were composed of 108 males (35.9%)

and 193 females (64.1%). Among the students, 175 were undergraduate students (58.1%) and 126 graduate students (41.9%), and all of them were using computers and the Internet. The respondents from Korea were composed of 151 males (49.2%) and 156 females (50.8%). Among the students, 234 were undergraduate students (76.2%) and 73 were graduate students (23.8%), and all of them were using computers and the Internet, as in Cambodia and Iran.

Table 3 Sample Characteristics

| Demographic Category | | Cambodia (N=288) | | Iran (N=301) | | Korea (N=307) | |
|---|-------------------|------------------|------------|--------------|------------|---------------|------------|
| | | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Gender | Male | 132 | 45.8% | 108 | 35.9% | 151 | 49.2% |
| | Female | 156 | 54.2% | 193 | 64.1% | 156 | 50.8% |
| Age | Under 18 | 8 | 2.8% | 4 | 1.3% | 2 | 0.7% |
| | 19~24 | 266 | 92.4% | 218 | 72.4% | 192 | 62.5% |
| | 25~29 | 12 | 4.2% | 69 | 22.9% | 86 | 28.0% |
| | 30~34 | 2 | 0.7% | 10 | 3.3% | 27 | 8.8% |
| | 35 and more | 0 | 0% | 0 | 0% | 0 | 0% |
| Education Level | Undergraduate | 285 | 99.0% | 175 | 58.1% | 234 | 76.2% |
| | Master | 3 | 1.0% | 85 | 28.2% | 63 | 20.5% |
| | Doctoral | 0 | 0% | 41 | 13.6% | 10 | 3.3% |
| What is the average time you use the Internet per week? | Never | 14 | 4.9% | 25 | 8.3% | 0 | 0% |
| | Less than 30 min. | 47 | 16.3% | 50 | 16.6% | 2 | 0.7% |
| | 30 min ~ 1 hour | 91 | 31.6% | 73 | 24.3% | 11 | 3.6% |
| | 1 ~2 hours | 69 | 24.0% | 66 | 21.9% | 40 | 13.0% |
| | 2 ~ 3 hours | 37 | 12.8% | 52 | 17.3% | 40 | 13.0% |
| | More than 3 hours | 30 | 10.4% | 35 | 11.6% | 214 | 69.7% |
| Where do you use the Internet? | Home | 105 | 36.5% | 156 | 51.8% | 146 | 47.6% |
| | School | 85 | 29.5% | 127 | 42.2% | 4 | 1.3% |
| | Internet Café | 68 | 23.6% | 15 | 5.0% | 0 | 0% |
| | Etc. | 30 | 10.4% | 3 | 1.0% | 157 | 51.1% |
| Do you have a computer? | Yes | 214 | 74.3% | 228 | 75.7% | 292 | 95.1% |
| | No | 74 | 25.7% | 73 | 24.3% | 15 | 4.9% |
| Do you have a internet connect at home? | Yes | 130 | 45.1% | 269 | 89.4% | 302 | 98.4% |
| | No | 158 | 54.9% | 32 | 10.6% | 5 | 1.6% |
| Are you using social media? | Yes | 218 | 75.7% | 153 | 50.8% | 269 | 87.6% |
| | No | 70 | 24.3% | 148 | 49.2% | 38 | 12.4% |
| Do you think IT skills can help someone's career development? | Yes | 279 | 96.9% | 278 | 92.4% | 273 | 88.9% |
| | No | 9 | 3.1% | 23 | 7.6% | 34 | 11.1% |

Table 4 shows the descriptive statistics of each item. The means of each item are over 4 to 7 except technology access. For technology access we measured the development of the ICT infrastructure and technology so the responses of some countries were negative. The detailed results are shown in Table 4.

Table 4. Descriptive Statistics

| | Cambodia(N=288) | | | | Iran (N=301) | | | | Korea (N=307) | | | |
|---------------------------------|-----------------|------|--------|------|--------------|------|--------|------|---------------|------|--------|------|
| | Male | | Female | | Male | | Female | | Male | | Female | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Motivational Access [MA] | | | | | | | | | | | | |
| MA1 | 5.45 | 1.47 | 5.83 | 1.26 | 6.01 | 1.44 | 6.06 | 1.24 | 6.13 | 0.82 | 5.71 | 1.04 |
| MA2 | 5.39 | 1.44 | 5.78 | 1.17 | 5.69 | 1.43 | 5.76 | 1.39 | 6.03 | 0.90 | 5.81 | 0.97 |
| MA3 | 5.26 | 1.42 | 5.39 | 1.36 | 5.62 | 1.45 | 5.51 | 1.40 | 6.10 | 0.85 | 5.83 | 0.96 |
| MA4 | 5.19 | 1.37 | 5.46 | 1.29 | 5.70 | 1.60 | 5.64 | 1.47 | 6.08 | 0.84 | 5.87 | 0.97 |
| MA5 | 5.86 | 1.21 | 6.08 | 1.03 | 5.54 | 1.53 | 5.73 | 1.45 | 5.85 | 0.84 | 5.67 | 1.02 |

| | | | | | | | | | | | | |
|----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| MA6 | 5.82 | 1.12 | 5.89 | 1.18 | 5.80 | 1.45 | 6.01 | 1.28 | 5.87 | 1.04 | 5.78 | 1.01 |
| MA7 | 5.68 | 1.17 | 5.78 | 1.15 | 5.51 | 1.57 | 5.82 | 1.30 | 5.87 | 0.96 | 5.63 | 1.10 |
| MA8 | 5.41 | 1.29 | 5.47 | 1.24 | 5.53 | 1.63 | 5.69 | 1.42 | 6.07 | 0.81 | 5.89 | 0.97 |
| MA9 | 5.01 | 1.52 | 5.11 | 1.49 | 5.49 | 1.40 | 5.53 | 1.57 | 5.72 | 0.91 | 5.74 | 0.92 |
| MA10 | 5.28 | 1.23 | 5.48 | 1.26 | 5.44 | 1.36 | 5.41 | 1.64 | 5.34 | 1.05 | 5.35 | 1.04 |
| MA11 | 4.98 | 1.46 | 5.08 | 1.32 | 5.38 | 1.72 | 5.33 | 1.76 | 5.53 | 1.03 | 5.59 | 1.01 |
| MA12 | 4.52 | 1.50 | 4.54 | 1.46 | 4.78 | 1.79 | 4.94 | 1.82 | 5.22 | 1.15 | 5.31 | 1.08 |
| Social Access [SA] | | | | | | | | | | | | |
| SA1 | 4.55 | 1.38 | 4.66 | 1.27 | 5.36 | 1.54 | 5.55 | 1.50 | 5.83 | 0.91 | 5.63 | 0.95 |
| SA2 | 5.14 | 1.39 | 5.09 | 1.33 | 5.36 | 1.49 | 5.77 | 1.42 | 5.83 | 0.96 | 5.55 | 1.07 |
| SA3 | 4.02 | 1.52 | 4.30 | 1.58 | 4.86 | 1.65 | 5.16 | 1.51 | 5.42 | 1.03 | 5.35 | 1.03 |
| SA4 | 5.12 | 1.38 | 4.90 | 1.50 | 4.77 | 1.68 | 4.96 | 1.68 | 5.61 | 1.01 | 5.44 | 1.00 |
| Skills Access [SKA] | | | | | | | | | | | | |
| SKA1 | 4.71 | 1.35 | 4.43 | 1.48 | 5.02 | 1.50 | 4.72 | 1.62 | 5.28 | 1.17 | 4.67 | 1.10 |
| SKA2 | 4.67 | 1.24 | 4.32 | 1.46 | 4.86 | 1.51 | 4.51 | 1.67 | 5.34 | 1.08 | 4.89 | 1.03 |
| SKA3 | 4.47 | 1.42 | 4.15 | 1.50 | 5.10 | 1.58 | 4.55 | 1.82 | 5.53 | 1.14 | 5.08 | 1.09 |
| SKA4 | 5.69 | 1.17 | 5.35 | 1.22 | 5.68 | 1.40 | 5.46 | 1.48 | 5.58 | 1.04 | 5.41 | 1.02 |
| Technology Access [TA] | | | | | | | | | | | | |
| TA1 | 4.02 | 1.55 | 4.11 | 1.50 | 2.43 | 1.48 | 3.21 | 1.57 | 6.01 | 0.91 | 5.77 | 0.91 |
| TA2 | 4.80 | 1.64 | 4.59 | 1.64 | 3.90 | 1.77 | 3.64 | 1.56 | 6.03 | 0.91 | 5.69 | 0.92 |
| TA3 | 4.45 | 1.60 | 4.53 | 1.57 | 3.71 | 2.05 | 3.45 | 1.70 | 5.77 | 1.01 | 5.62 | 0.95 |
| TA4 | 3.56 | 1.60 | 3.69 | 1.71 | 1.73 | 1.46 | 2.13 | 1.55 | 5.74 | 1.16 | 5.69 | 1.00 |
| Online Participation [OP] | | | | | | | | | | | | |
| OP1 | 5.04 | 1.39 | 4.79 | 1.61 | 3.94 | 2.01 | 3.56 | 1.98 | 4.79 | 1.24 | 4.79 | 1.39 |
| OP2 | 4.58 | 1.55 | 4.32 | 1.70 | 3.60 | 2.03 | 3.32 | 1.96 | 4.67 | 1.30 | 4.70 | 1.31 |
| OP3 | 4.96 | 1.40 | 4.58 | 1.62 | 3.74 | 1.96 | 3.67 | 1.98 | 4.70 | 1.25 | 4.65 | 1.34 |

4. Data Analyses Results

4.1 Exploratory Factor Analysis (EFA)

Some of the measurement items we used in this study had never been used in an empirical study. Social Access, Skills Access, and Technology Access measurement items were used in this study for the first time. For this reason, the exploratory factor analysis was carried out with a Principal Component Analysis (PCA) on digital access attributes. The results of the EFA show that our measurement items consist of seven components with Eigenvalues over 1. The factor loading values were all over 0.6 and most of the factor loading values were over 0.7, except for two loading values. Thus, by the definition of factor loading in this study, the result of the EFA shown here in Table 5 indicates that the explanatory concepts of each factor are well categorized. To check the factor for motivational access, we used a second-order concept from another statistical method. The perceived ease of use (PEU), perceived usefulness (PU), and perceived enjoyment (PE) were handled in a separate EFA and were meant to measure in one variable.

Table 5. Result of EFA

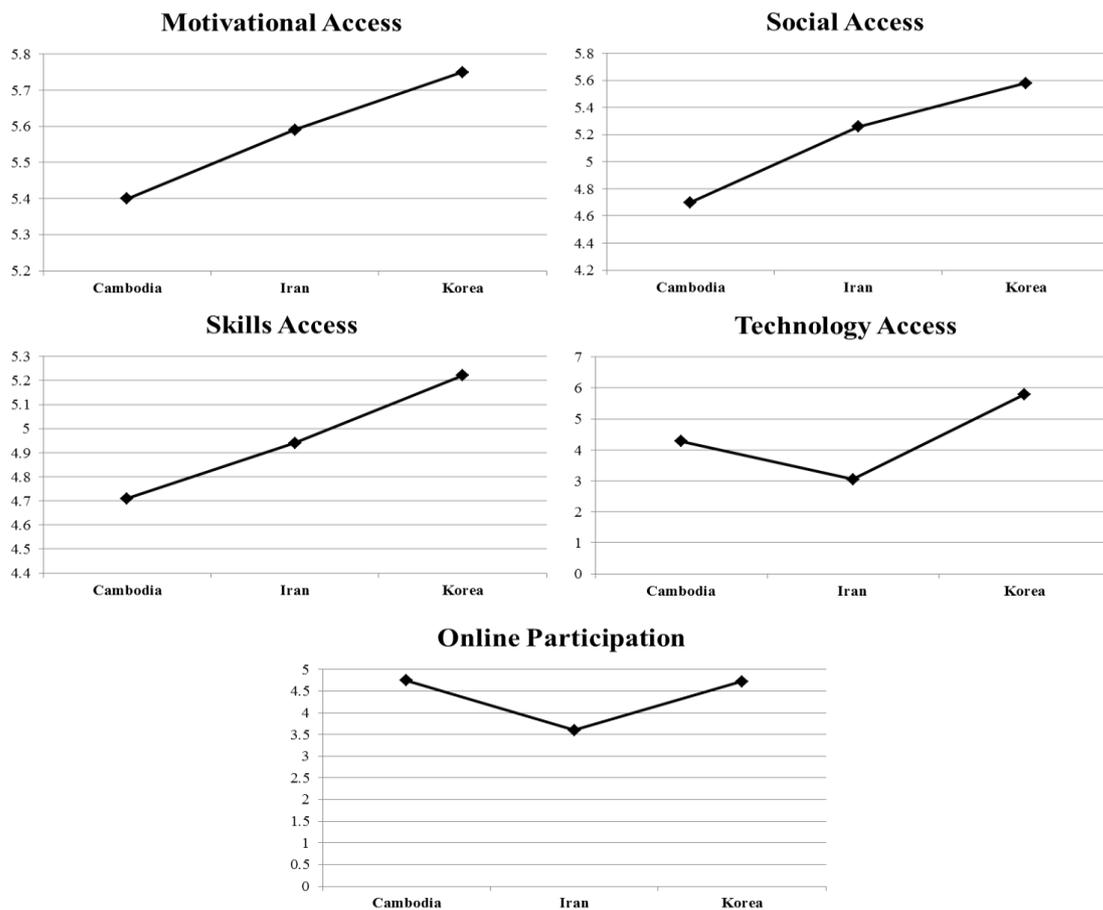
| | Component | | | | | | |
|------|-------------|-------|-------------|-------------|-------------|-------------|------|
| | PE | TA | PU | PEU | SKA | SA | OP |
| MA1 | .143 | -.017 | .146 | .797 | .156 | .164 | .064 |
| MA2 | .172 | .045 | .244 | .782 | .192 | .083 | .099 |
| MA3 | .148 | .125 | .174 | .762 | .206 | .170 | .066 |
| MA4 | .143 | .111 | .183 | .754 | .215 | .180 | .116 |
| MA5 | .116 | .015 | .797 | .256 | .098 | .016 | .059 |
| MA6 | .126 | -.002 | .830 | .161 | .114 | .093 | .080 |
| MA7 | .158 | .018 | .839 | .126 | .098 | .155 | .059 |
| MA8 | .167 | .099 | .709 | .134 | .153 | .212 | .035 |
| MA9 | .791 | .089 | .153 | .196 | .141 | .155 | .099 |
| MA10 | .818 | -.011 | .234 | .194 | .113 | .084 | .114 |
| MA11 | .843 | .036 | .131 | .134 | .068 | .205 | .087 |
| MA12 | .837 | .099 | .090 | .069 | .085 | .222 | .071 |
| SA1 | .212 | .132 | .158 | .270 | .280 | .670 | .045 |
| SA2 | .235 | .034 | .274 | .171 | .222 | .729 | .120 |
| SA3 | .161 | .181 | .051 | .132 | .114 | .793 | .014 |
| SA4 | .184 | .207 | .126 | .121 | .172 | .733 | .176 |
| SKA1 | .082 | .100 | .105 | .198 | .825 | .199 | .123 |
| SKA2 | .099 | .147 | .139 | .162 | .856 | .133 | .175 |

| | | | | | | | |
|-------------|------|-------------|------|-------|-------------|------|-------------|
| SKA3 | .163 | .144 | .087 | .190 | .771 | .187 | .166 |
| SKA4 | .094 | .009 | .239 | .307 | .617 | .192 | .139 |
| TA1 | .050 | .883 | .064 | .057 | .114 | .119 | .057 |
| TA2 | .043 | .805 | .038 | .108 | .072 | .136 | .126 |
| TA3 | .077 | .786 | .004 | .069 | .091 | .139 | .172 |
| TA4 | .020 | .867 | .008 | -.021 | .058 | .046 | .136 |
| OP1 | .120 | .206 | .112 | .083 | .142 | .072 | .881 |
| OP2 | .111 | .252 | .035 | .078 | .190 | .111 | .849 |
| OP3 | .103 | .084 | .074 | .133 | .165 | .085 | .858 |

4.2 Result

Figure 3 shows the results of comparisons of four access factors and online participation among the three countries. The motivational access, social access, and skills access clearly show that access matters with ICT and human development ranking. For the motivational, social, and skills access, Korea had significantly greater mean scores than Iran and Cambodia, and Iran had greater mean scores than Cambodia, indicating that a student in a country with higher ranking in ICT and human development feels better in the motivation, social, and skills access perspective. However, the technology access and online participation had different results with other access variables. For technology access, Korea had significantly greater mean scores than Cambodia and Iran, and Cambodia had greater mean scores than Iran. The reason for this result may relate to government regulation on Internet usage and ICT policy. Iran is a country that frequently blocks the Internet, especially social media and the mobile Internet. Iran's limited conditions for using the Internet may affect the students' perception on online participation as well.

Figure 3. Motivational access, social access, skills access, technology access, and online participation comparisons between countries.



We also conducted a one-way ANOVA test to identify the cross-national differences in digital access and online participation, and the results reveal significant differences among the three countries. To check the

difference between countries, we used a post-hoc Scheffe analysis. Table 6 shows that there were significant differences among the countries regarding their social access (SA) and technology access (TA). These results show that social access is better in countries from a higher ranking ICT and human development perspective. In other words, the analysis shows that countries that are more developed economically can provide better access in the social perspective. However, technology access shows a different result than social access. As we know, Iran is higher ranking than Cambodia in terms of ICT and the human development index, but the technology access result revealed that Cambodia had a higher perception in the technology access perspective. Based on this result, we assume that countries that have strong regulation on ICT usage lower perception of technology access perspective. Iran's government frequently blocks or shuts down the national Internet access of users in Iran. Thus, this reflects on the technology access results of that country.

The comparisons for the motivational access (MA) show that Korea and Iran had greater mean scores than Cambodia. This means that Cambodian students have less motivation for using IT systems and the Internet because they feel that IT systems and the Internet are less useful and enjoyable to them than it is for students in Korea and Iran. Skills access (SKA) and online participation (OP) results also show differences between the three countries. Korea had a higher access score on skills access and online participation. Korea is the one of the top ranked countries in terms of ICT development. In Iran, the government's strong regulation affects students' online participation. At the same time, a lack of IT infrastructure, like Internet connections, affects Cambodian students' online participation. Furthermore, the skills access results show that ICT skill and self-efficacy are lower in Iran and Cambodia.

Table 6. ANOVA test results

| Variable | (1) Cambodia (n=288) | | (2) Iran (n=301) | | (3) Korea (n=307) | | Total (n=481) | | ANOVA (df=2) | | | Post Hoc (Scheffe) |
|------------|----------------------|------|------------------|------|-------------------|------|---------------|------|--------------|--------|------|-------------------------|
| | Mean | S.D | Mean | S.D | Mean | S.D | Mean | S.D | MS | F | p | Different Groups |
| MA | 5.40 | 0.88 | 5.59 | 0.96 | 5.75 | 0.75 | 5.58 | 0.88 | 9.09 | 12.07 | 0.00 | (1)-(2),(1)-(3) |
| SA | 4.70 | 1.09 | 5.26 | 1.31 | 5.58 | 0.89 | 5.19 | 1.16 | 58.36 | 47.52 | 0.00 | (1)-(2),(1)-(3),(2)-(3) |
| SKA | 4.71 | 1.11 | 4.94 | 1.40 | 5.22 | 1.00 | 4.96 | 1.20 | 19.69 | 14.16 | 0.00 | (1)-(3),(2)-(3) |
| TA | 4.28 | 1.27 | 3.05 | 1.20 | 5.79 | 0.81 | 4.38 | 1.58 | 573.09 | 466.35 | 0.00 | (1)-(2),(1)-(3),(2)-(3) |
| OP | 4.75 | 1.34 | 3.60 | 1.80 | 4.72 | 1.24 | 4.35 | 1.57 | 127.40 | 57.96 | 0.00 | (1)-(3),(2)-(3) |

To compare the gender gap in digital access, we conducted a t-test analysis. Tables 7, 8, and 9 show the comparisons for the four different perspectives of digital access and online participation. The samples of all three countries demonstrate that skills access (SKA) had significant differences between genders. This means that female students are less confident than men in using IT systems and the Internet. Motivational access, social access, technology access, and online participation were not significant between genders in Cambodia and Iran. However, for the technology access, Korean sample shows a different result than Cambodia and Iran. Korean male students had greater scores on ICT infrastructure and connection. Based on the t-test results, we confirm that male students are more confident using ICT systems and the Internet and also having better information related ICT than female students.

Table 7. Comparisons between Male and Female Students of Cambodia

| Variable | Male(n=132) | | Female(n=169) | | F | p-Value |
|------------|-------------|------|---------------|------|------|--------------|
| | Mean | S.D | Mean | S.D | | |
| MA | 5.32 | 0.90 | 5.49 | 0.86 | 0.05 | 0.10 |
| SA | 4.71 | 1.05 | 4.74 | 1.15 | 1.29 | 0.83 |
| SKA | 4.89 | 1.00 | 4.56 | 1.19 | 3.21 | 0.01* |
| TA | 4.21 | 1.25 | 4.23 | 1.33 | 0.50 | 0.89 |
| OP | 4.86 | 1.26 | 4.56 | 1.44 | 3.67 | 0.06 |

Table 8. Comparisons between Male and Female Students of Iran

| Variable | Male(n=108) | | Female(n=193) | | F | p-Value |
|----------|-------------|------|---------------|------|------|--------------|
| | Mean | S.D | Mean | S.D | | |
| MA | 5.54 | 0.93 | 5.62 | 0.98 | 2.58 | 0.50 |
| SA | 5.09 | 1.37 | 5.36 | 1.27 | 1.10 | 0.08 |
| SKA | 5.16 | 1.30 | 4.81 | 1.44 | 1.41 | 0.03* |
| TA | 2.94 | 1.19 | 3.11 | 1.21 | 0.02 | 0.26 |
| OP | 3.76 | 1.84 | 3.52 | 1.78 | 0.38 | 0.27 |

Table 9. Comparisons between Male and Female Students of Korea

| Variable | Male(n=151) | | Female(n=156) | | F | p-Value |
|----------|-------------|------|---------------|------|------|--------------|
| | Mean | S.D | Mean | S.D | | |
| MA | 5.82 | 0.70 | 5.68 | 0.79 | 5.90 | 0.11 |
| SA | 5.67 | 0.84 | 5.49 | 0.92 | 4.71 | 0.08 |
| SKA | 5.43 | 1.01 | 5.01 | 0.94 | 0.85 | 0.00* |
| TA | 5.89 | 0.77 | 5.69 | 0.83 | 1.64 | 0.04* |
| OP | 4.72 | 1.19 | 4.72 | 1.30 | 1.17 | 0.98 |

5. Discussion

Beyond the information society, the global society is moving toward a network society in which everyone is connected by real-time Internet technology. Many people around the world are now connecting with other people around the world via the Internet. Through those connections, they are constantly looking for solutions to resolve their problems and are trying to change their lives. Currently, 800 million people are using Facebook every day, and the domain of the global cyber society is expanding every moment. Now is a good time to talk about not only the digital divide but also the information divide. There are many people who cannot experience ICT technology and service: more than half of the world population. They are an isolated group who are far away from the new technology and society.

In this study, we developed measurement items that can measure people's perception of digital access and online perspective. We conducted surveys in three countries, Cambodia, Iran, and Korea. These three countries are clearly separated by the ranks of the ICT development index and the human development index. For more than a decade, many scholars have been trying to develop a better digital divide index but most of them use secondary data and only infrastructure level data. To deepen the research, we need to develop measurement items that can measure the people's perception of their digital divide and access perspective. Based on the above motivation, this study embraced previous studies on digital access theory and empirically verified people's perception of digital access: motivational access, social access, skills access, technology access, and online participation.

The academic implications of this study are three-fold: 1) We developed measurement items to measure the digital access, such as motivational, social, skills, technology access based on a cross-national comparison study. 2) We found that the measurement items we developed clearly reflect the level of ICT and human development status. We also found that a government's strict regulation on using ICT systems and the Internet decrease the people's perception on technology access and online participation. Thus, we should consider regulation and policy when we are doing digital divide studies. 3) We empirically investigated the differences in the digital divide between genders. This is the first study conducted on digital access variables and online participation. Our study found that between male and female students, skills access is one variable that was significantly different. This means that the skills access perspective is the key variable and can measure the gender gap in the digital divide.

In addition, this study found a few practical implications. First, when a government tries to increase their capability on the ICT perspective, they need an overall view in their planning. They should consider various aspects of society, such as a person's motivation, social perspective, skills, available technology or infrastructure, and gender. Our study found that different levels of ICT and human resource development clearly

result in significant differences between countries. To reduce the gender gap on the digital divide, societies should provide better ICT education for women and must have a different way to teach ICT courses. Our study had some limitations: our sample was only from university students rather than from all areas of the society, and our study did not cover variables like anxiety, gender stereotype, and actual usage of ICT systems and the Internet. In a further study, we will consider these limitations and collect nationally represented samples and add more variables that are closely related to the gender digital divide.

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