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Research paper

The Empirical Study on Digital Literacy from the Viewpoint of Digital Accessibility

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Abstract

The purpose of this study is to empirically analyze the effect of motivation factor in digital literacy. In particular, we examine the cumulative and recursive model of digital access, and examine the causal path of motivation factor to digital usages by analyzing the effects of motivation access on material access, skill access, and usage access. For the analysis, we used 'the digital divide index and actual survey' data of National Information Society Agency (NIA). The analytical model used the structural equation, and the statistics program used SPSS 23 and Amos 23. The results show that the motivation factor for digital literacy has a significant effect on material access, skill access and usage access. Policies that take into account motivations factors in digital literacy need to be strengthened.

Keywords: *Digital literacy, Digital divide, material access, digital access, motivation, digital skill, digital usage*

1. Introduction

The transition to smart society, which began with the introduction of smart devices, is promoting new changes in the areas of politics, economy, society, and culture with the development of smart technologies such as Big Data, cloud computing, and Internet of Things.

However, despite these changes, the problems that have persisted since the information age are still continuing. The development of new digital technologies has created social problems due to the digital divide as much as the convenience of new services. Digital literacy is an essential capability to live in the digital age, but it can deepen inequality in all spheres of society, economy and politics due to the digital divide. In other words, the emergence of smart devices including smartphones and the increase of various contents and services delivered over the Internet can increase the possibility of new opportunities. However, in addition to the existing PC-based digital divide, smart-based digital divide may deepen social inequalities.

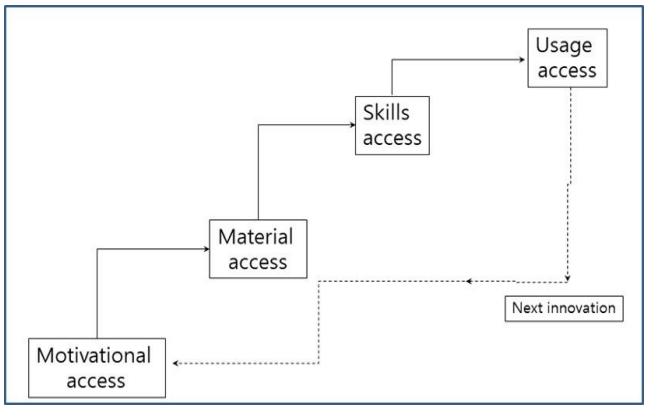
How can we solve the problem of digital inequality caused by the difference in ability to utilize digital devices as basic human capital? One of the most noteworthy issues in the field of digital divide research is the motivational factors that work before material access or digital usages. Therefore, the purpose of this study is to analyze the effects of motivational factors on the usage of digital services.

2. Literature Review

The digital divide was defined as the gap between those who do and those do not have access to computer and the Internet [1][2][3]. Until now, most studies on the information gap have focused on the information gap of socioeconomic dimension such as age, sex, income, education, and occupation [1][2][3][4][5][6][7][8][9][10][11][12][13][14][15][16][17][18][19][20][21][22].

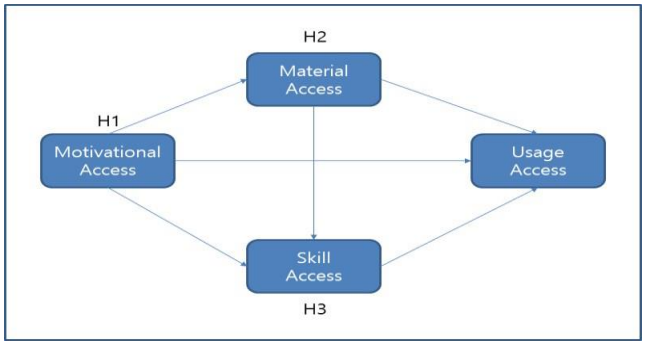
However, for a deeper understanding of the digital divide, an approach based on digital access is needed. The digital divide is a complex concept that includes various access. Digital access is a multi-dimensional concept, which means various accessibility in terms of motivational access, material access and usage. In general, digital accessibility consists of material or physical access related to the capabilities of the Internet or information devices, skill access, including the ability to handle hardware and software, and usage access, including various uses and utilization of digital contents [1][2][3]. These four successive stages or kinds of access are supposed to be cumulative. The improvement in digital accessibility at each stage affects not only the next step but also the subsequent steps. Based on the above discussion, we will use the concept of digital accessibility in understanding and defining digital literacy as shown in [Fig.1].

This study aims to empirically analyze four levels of accessibility of digital literacy. In particular, we will positively confirm the path that material access, skill access, and usage access are spreading around motivational access, which has not been covered much in the digital divide research.



[Fig. 1] Continuity of accessibility in digital technology

3. Research Framework and Methods



[Fig. 2] Conceptual Framework

The research question of this study is "How does the motivational access in digital literacy affect material access, skill access, and usage access?" The specific hypothesis of this study related to the effects of motivational factors on information literacy for verifying research problems is as follows.

H1. Motivational access factor will have a positive impact on material access, skill access, and usage access.
H2. Material access will have a positive impact on skill access and usage access.
H3. The technical approach will have a positive impact on usage access.
This study uses data gather from the "Survey on the digital divide" in the National Information Agency (NIA) in 2015. This data is the national approval statistics, which can be used to increase the reliability of the collected data and the validity of the data collection process. The main variables and measurement methods used in the study are as follows.

Table.1. Main Variables and Measurements

Smart device based Digital Literacy	Variable Description and measurements
motivational access: recognizing the necessity (importance) of smartphone	(Smart phone importance in each of the following items), 1. Economic activities (including consumption activities such as purchases) 2. Leisure (hobby) and cultural life 3. Social activities 4. Interpersonal Relationship (Maintaining relationship with an old person and meeting new person) 5. Business or academic activity 6. Know the news or news 7. Getting information and knowledge * Likert 4-points scale
Material access	1 Whether to have a smartphone (1 = hold, 2 = not show) 2 Whether you have a smart pad (1 = hold, 2 = not show) 4 Other mobile smart devices (1 = hold, 2 = not show) => Retain smart devices = 1, No smart devices = 0
Skill access	(Basic operation ability of smart device) 1. Basic device configuration 2. Wireless network and Bluetooth settings 3. Move files to your computer 4. File transfer 5. Installing and using necessary apps 6. Malicious code inspection and treatment 7. Writing documents or materials * Likert 4-points scale
Usage access -Social participation -Economic activity -Human networking	(Degree of information sharing/human relations and networking activities) 1. Internet information posting 2. Internet information sharing 3. Maintaining existing relationships, forming new relationship networks * Likert 4-points scale
	(Degree of social participation activity) 1. Social Concerns (Public Issues) opinion Expression 2.Suggestions or suggestions for government / local governments / public institutions 3. Social contribution activities such as donation / service / politics 4. Community activities related to local / political / social participation Participate in online voting, polling, signing, etc. * Likert 4-points scale
	(Degree of economic opportunity activity) 1. Activities that help you get a job or change your job 2. Activities that help start a business or operate a business 3. Related information to help increase income activity 4. Activities that help reduce costs * Likert 4-points scale

The structural equation model was used for the analysis of the research problem, and the program used were SPSS 23.0 and AMOS 23.00.

4. Finding and Discussion

4.1. Descriptive Statistics

The total sample size of the survey participants is 5,500. According to the demographic characteristics, the age was less than 10 years, 0.6% (31 persons), 15.3% (841 persons) in their teens, 13.7% (756 persons) in their 20s, 16.8% (924 persons) (647 persons) in their 60s and 6.6% (364 people in their 70s or older). Sex is 50% (2749) for males and 50% (2751) for females. The final education level is 14.7% (809 students) in elementary school graduation, 16.9% (930 students) in middle school graduation, 40.7% (2238 students) in high school graduation and 27.5% (1512 students) in university graduation. 60% of the occupations are occupations, and 40% are unemployed, including the full-time housewife. The average monthly household income of households is 1.6%, 500,000 won is 4.8%, 100-100 thousand won is 13.1%, 200-3 million won is 23.2%, 300-4 million won is 28.9%, 400-5 million won is 15.5%, 7.9% for 500-600,000 won, and 3.3% for over 6 million won. 78.3% (4307 people) have smartphones and 21.7% (1193 people) are not.

The main results of the descriptive statistics of other variables are shown in the table below.

Table. 2. Descriptive Statistics

	N	Min	Max	Mean	S.D
Motivational access (7 items)	5500	1.00	4.00	2.994	.61866
Skill access (7 items)	5500	1.00	4.00	2.459	1.02058
Human networking (4 items)	4369	1.00	4.00	2.371	.79484
Social Participation (5 items)	4369	1.00	4.00	1.578	.71212
Economic activities (4 items)	4369	1.00	4.00	1.759	.80627
N	4369				

4.2 Validity and Reliability of Measurements

Before the path analysis, the validity and reliability test of the measurement tool were performed. First, confirmatory factor analysis was performed to check the validity of specific tools. The main contents of AVE (Average variance extraction) and C.R (Concept reliability) according to confirmatory factor analysis are shown in the table below.

Table.3. Confirmatory Factor Analysis

	Human networking	Social participation	Economic activity	Skill access	Motivational access	AVE	C.R.
Human networking	1					0.522	0.801
Social participation	0.293	1.000				0.679	0.939
Economic activity	0.220	0.407	1.000			0.649	0.889
Skill access	0.254	0.072	0.070	1.000		0.682	0.945
Motivational access	0.082	0.020	0.076	0.152	1	0.43	0.912

4.3 Path analysis results

The model fit was analyzed using the absolute fit index (GFI 0.923, RMR 0.051, RMSEA 0.055), incremental fit index (NFI 0.942, RFI 0.932, IFI 0.946, CFI 0.946, TLI 0.936), Parsimonious fit index 0.904), all of which are shown as suitable.

The main results of path analysis are as follows. First, motivational access is positively significant for both material access, skill access, usage access (social participation, economic activity, and human networking). Second, material access is positively (+) significant for skill access, usage access (social participation, economic activity, human networking).

The results of this analysis show the continuity and accumulation of accessibility in digital literacy as discussed above. In other words, motivational factors in the use of devices and services based on new technologies can contribute to digital literacy by increasing skill access and usage accesses related to digital accessibility.

Table.4. Results of path analysis

			Estimate	standardized Estimate	S.E.	C.R.	P
Material access	←	Motivational access	0.071	0.19	0.006	11.691	***
Skill access	←	Material access	1.01	0.265	0.056	17.926	***
Skill access	←	Motivational access	0.487	0.34	0.024	20.289	***
Social participation	←	Material access	0.256	0.067	0.062	4.105	***
Economic activity	←	Material access	0.322	0.082	0.063	5.088	***
Social participation	←	Skill access	0.23	0.23	0.019	12.349	***
Economic activity	←	Skill access	0.163	0.159	0.019	8.69	***
Social participation	←	Motivational access	0.058	0.04	0.026	2.217	***
Economic activity	←	Motivational access	0.291	0.198	0.027	10.764	***
Human Networking	←	Material access	0.238	0.051	0.07	3.41	***
Human Networking	←	Motivational access	0.18	0.103	0.029	6.117	***
Human Networking	←	Skill access	0.547	0.447	0.022	24.69	***
Absolute fit index: GFI 0.923, RMR 0.051, RMSEA 0.055 Incremental fit index: NFI 0.942, RFI 0.932, IFI 0.946, CFI 0.946, TLI 0.936 Parsimonious fit index: AGFI 0.904							

5. Conclusion

This study is an empirical study on digital literacy. In the meantime, research on digital literacy is relatively lacking in studying what digital literacy is, mainly focusing on the digital divide. This study divides digital literacy into four layers by understanding digital literacy in terms of information accessibility. And that the four digital information accessibilities are continuous and cumulative rather than discontinuous.

In order to verify the theoretical discussion on the characteristics of digital literacy, we conducted empirical analysis through the data of NIA. As a result of the analysis, all major research hypotheses were adopted. First, motivational access factor has a positive impact on material access, skill access, and usage access. Second, material access has a positive impact on skill access and usage access. Third, the technical approach had a positive impact on usage access. More active research on motivational access, which has not been noticed, is needed in the future.

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