

Effects of Perceived Interactions of Digital Transformed Services on Intention to Accept Technology

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디지털로 전환된 서비스의 지각된 상호작용이 기술수용의도에 미치는 영향

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Abstract The purpose of this study is to verify the influence relationship of digitally converted services on consumers' intention to use since traditional services are being converted to digital services due to technological development and increase in non-face-to-face services. The study consisted of a program development procedure and a program effectiveness verification procedure, and bootstrapping was performed to verify the mediating effect adjusted along with multiple regression analysis. The subjects of this study were 323 university (graduate) students and the general public residing in Korea. Results. First, it was found that the three perceived interaction factors (perceived communication, perceived control, and perceived reactivity) of digital transformed services had a positive effect on perceived usefulness and perceived ease of use, respectively. Second, the relationship of influence of technology acceptance intention was verified. Third, it was confirmed that the effect of the three perceived interaction factors of digital transformed services on intention to use was mediated by perceived usefulness and perceived ease of use. Fourth, the mediating effect mediated by digital disparity was confirmed. As a result, it was confirmed that the three perceived interaction factors of the digitally converted service are important factors in the intention to use the digitally converted service. This suggests that efforts are needed to minimize the digital divide.

Key Words : Technology Acceptance Model, Digital Transformation, Digital Transformation of Services, Digital divide, Perceived interactivity

요약 본 연구의 목적은 기술발전과 비대면서비스의 증가에 의해 전통적인 서비스가 디지털서비스로 전환되고 있으므로, 디지털로 전환된 서비스가 수용자의 수용의도에 미치는 영향관계를 검증하는 데 있다. 연구는 프로그램 개발 절차와 프로그램 효과성 검증 절차로 이루어졌고, 다중회귀분석과 함께 조절된 매개효과를 검증하기 위해 Bootstrapping을 실시하였다. 연구대상은 국내에 거주하는 대학(원)생과 일반인 323명을 대상으로 진행되었다. 연구결과, 첫째, 디지털로 전환된 서비스의 지각된 상호작용 세 요인(지각된 커뮤니케이션, 지각된 제어, 지각된 반응성)은 지각된 유용성과 지각된 사용용이성에 각각 긍정적인 영향을 주는 것으로 나타났다. 둘째, 기술수용의도의 영향관계를 검증하였다. 셋째, 디지털로 전환된 서비스의 지각된 상호작용 세 요인이 사용의도에 미치는 영향은 지각된 유용성과 지각된 사용용이성에 의해 매개됨을 확인할 수 있었다. 넷째, 디지털 격차에 의한 조절된 매개효과를 확인하였다. 그 결과, 디지털로 전환된 서비스의 지각된 상호작용 세 요인이 디지털로 전환된 서비스 사용의도의 중요한 요인임을 확인했고, 디지털 격차에 의해 디지털전환 서비스에 대한 수용의도가 달라질 수 있으므로 국가와 기업차원의 디지털격차를 최소화하기 위한 노력이 필요함을 시사한다.

주제어 : 기술수용모델, 디지털 트랜스포메이션, 디지털로 전환된 서비스, 디지털격차, 지각된 상호작용성

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1. Introduction

Recently, development of digital service technology has reduced the cost of digital transformation [1], and makes it possible to realize cloud service, mobile order and payment, economic activities in virtual reality, and counseling service, etc. As a result, traditional man-to-man service interaction is transformed into man-to-digital service interaction, fundamentally changing our society and daily lives [2].

In a 2011 report of IBM Institute for Business Value defined digital transformation as “the strategy of business to create a new business model and set a new direction of industry by combining digital and physical components [3]. McKinsey Global Institute (2014) said that “While there can be differences in speed of digital transformation, it is not a fad at one time, but a phenomenon which will continue to happen in all industries [4].

With the onslaught of the Covid-19 pandemic in 2020, digitalization has been accelerated, changing many services, and expectations and behaviors of consumers. It is changing paradigms of industries and the society, promoting changes of traditional businesses [5, 6, 7]. Goals of digital transformation can be categorized into three types: improvement of the product, automation of the process, and simplification of communication [8]. This study defines the category of ‘simplification of communication’, interface of customers and digital service, as DTS (Digital Transformation of Service).

We can assume that interaction experiences of DTS will lead users to expect usefulness and convenience of using it and the interaction experiences of it will affect intention to use it. But there have been not sufficient researches on it. Therefore, it is necessary to study the effect of interaction factors of DTS and the usefulness and convenience of DTS on intention to use. Meanwhile, rapid change of service into

digitalization has led to digital inequality [9, 10, 11]. Since the digital divide among people using DTS will adversely affect social participation and economic activity, we investigated the impact of the digital divide on perceived usability and intent to use.

By revealing the effects of DTS interaction and willingness to use DTS, it is expected that the findings of this study may give some practical hints in establishing and running business strategies to companies which consider adopting DTS.

2. Theoretical backgrounds and hypothesis setting

2.1 Technology acceptance model (TAM)

Technology acceptance model proposed by Davis (1989) is the model which analyzes the causal relationship between beliefs in specific innovations and acceptance of them [12]. It has been widely used in information system area. TAM contains specific beliefs on perceived usefulness and perceived ease of use [13].

Perceived usefulness is the degree to which users perceive that a new information technology and service will improve behavior and improve work performance. Perceived ease of use is the degree to which users perceive that they can easily learn and apply the specific technology. Davis (1989) defines perceived ease of use as the degree of subjective belief on the ease of using a specific technology, that is, the degree to which an individual perceives that he or she will not need to spend physical and mental efforts in using a specific technology or the degree of freedom from efforts to learn how to use it [13,14].

2.2 Perceived interactivity on DTS and TAM

Interaction is communication between humans and other humans or things [15]. In the digital

economy, interactivity can be understood as actions and reactions to new digital services [18], and perceived interactivity for DTS can be said to be an interaction between humans and digital.

Perceived interaction includes 3 elements: perceived communication, perceived control, and perceived responsiveness [9,17]. According to Lu, Lai & Liu (2019), interaction felt by digital service user has positive effect on willingness to use it [17]. Perceived interactivity is the concept based on subjective perception, and the same channel can cause different responses to different users. Therefore, high digital interaction means high preference to digital service [1,19].

Among the three elements of interaction, perceived communication is the degree to which user believes that the system or the medium facilitates two-way communication [9]. DTS has interactivity through problem solving, effective Feedback, two-way communication. Thus, perceived communication provides strong interaction in digital service [17]. Perceived control is perceived control on the interaction process reflects self-confidence of the user. Perceived control can be understood as control over service order and timing [19,21]. perceived control has usable, know clearly, choose freely, control over user experience. The more DTS user knows the electronic service how to use it(i. e. information search, order), the more the user perceives that he or she controls it[17].

Perceived responsiveness is perceived responsiveness of digital service to the user's action.[19] Digital service user expects that he or she can get instant information and quick response and answer [17].

In this study, it is assumed that the perceived usefulness and the perceived ease of use that users can obtain by using digital services can be confirmed through the perceived interactivity of DTS [17]. Therefore, to examine intention of DTS user, this study that three elements of perceived interactivity for DTS are explained them as

precedent elements in determining motivations of the technology acceptance model.

2.2.1 Perceived interactivity on DTS and perceived usefulness of DTS

According to Davis (1989), perceived usefulness is major motivation to accept information technology [13,20]. And Lu, Lai & Liu (2019) found out that there is significant relationship between interaction of digital device and perceived usefulness., The research discovered that three elements of interaction (perceived communication, perceived control, and perceived responsiveness) have positive (+) effects on perceived usefulness via perceived ease of use [17,22]. This study, assuming that three elements of perceived interactivity will have direct positive (+) effect on perceived usefulness, set the following hypotheses.

- H1: Perceived interactivity on DTS will have positive (+) effect on perceived usefulness.
- H1-1: Perceived communication on DTS will have positive (+) effect on perceived usefulness.
- H1-2: Perceived control on DTS will have positive (+) effect on perceived usefulness.
- H1-3: Perceived responsiveness on DTS will have positive (+) effect on perceived usefulness.

2.2.2 Perceived interactivity on DTS and perceived ease of use of DTS

Davis (1989) defines perceived ease of use as major motivation to accept information technology to reduce personal efforts [13,20]. And Lu, Lai & Liu (2019) identified that there is significant relationship between interaction and perceived ease of use of digital device. The research discovered that three elements of interaction (perceived communication, perceived control, and perceived responsiveness) have

positive (+) effects on perceived ease of use [17,22]. Therefore, assuming that three elements of perceived interactivity will have positive (+) effect on perceived ease of use, this study set the following hypotheses.

- H1: Perceived interactivity on DTS will have positive (+) effect on perceived ease of use.
- H1-1: Perceived communication on DTS will have positive (+) effect on perceived ease of use.
- H1-2: Perceived control on DTS will have positive (+) effect on perceived ease of use.
- H1-3: Perceived responsiveness on DTS will have positive (+) effect on perceived ease of use.

2.2.3 Perceived usefulness, perceived ease of use, and intention to use

Venkatesh & Davis (2000) found out that perceived usefulness and perceived ease of use have strong and positive effects on intention to use. Lu, Lai & Liu (2019) had similar findings. Based on such previous researches, this study set the following hypotheses [13,17,18].

- H3: Perceived usefulness will have positive (+) effect on intention to use.
- H4: Perceived ease of use will have positive (+) effect on intention to use.

2.3 Mediating effects of perceived usefulness and perceived ease of use

With the change of external environment, companies tend to digitalize their services, and adopt DTS optimized to customers. In the respect of perceived interactivity, this study intends to reveal the effects of perceived usefulness and perceived ease of use of DTS on intention to use it.

2.3.1 Mediating effect of perceived usefulness

Using TAM of Davis (1989), Venkatesh & Davis (2000), Lu, Lai & Liu (2019) found out that perceived usefulness of DTS has mediating effect on intention to use it among users [13,18]. Based on such previous findings, this study set the following hypotheses about the mediating effect of perceived usefulness on three elements of interaction (perceived communication, perceived control, and perceived responsiveness).

- H5: The effect of perceived interactivity on DTS on intention to use it will be mediated by perceived usefulness.
- H5-1: The effect of perceived communication on DTS on intention to use it will be mediated by perceived usefulness.
- H5-2: The effect of perceived control on DTS on intention to use it will be mediated by perceived usefulness.
- H5-3: The effect of perceived responsiveness on DTS on intention to use it will be mediated by perceived usefulness.

2.3.2 Mediating effect of perceived ease of use

Based on the findings of Venkatesh & Davis (2000), Lu, Lai & Liu (2019) that perceived ease of use of DTS mediates the effect of perceived interactivity on intention to use, this study set the following hypotheses.

- H6: The effect of perceived interactivity on DTS on intention to use it will be mediated by perceived ease of use.
- H6-1: The effect of perceived communication on DTS on intention to use it will be mediated by perceived ease of use.
- H6-2: The effect of perceived control on DTS on intention to use it will be mediated by perceived ease of use.
- H6-3: The effect of perceived responsiveness on DTS on intention to use it will be mediated by perceived ease of use.

2.4 Moderated mediating effect by digital divide

The digital divide represents the gap between those who can benefit from the digital age and those who don't [19]. Digital divide has been an issue in America for about 20 years [21]. With the rapid development of technology, the number of people accessing digital services including the Internet is increasing, but people feel cannot keep up with technology and technology-related media and are isolated, including digital devices and digital services. So, gap in access to and use of digital information is increasing [10]. Those who are difficult in access to, understanding and use of digital data are in disadvantageous positions in recruitment, trust, insurance, and medical care [10,21].

According to Bélanger & Carter (2009), the digital divide means with and without information access. [22]. Chang, Shahzeidi, and Kim & Park (2012) viewed Access and Online Participation as major variables in Measurement Items for Digital divide [23]. In this study, the Opportunities for using DTS, hours of use, opportunities to connect, access to information were defined as variables that deepen the digital divide. As Rogers (2010) pointed out, one of the reasons why some people are more innovative than others in the development and innovation of new technologies is that they have easy access to information and information processing technologies [21]. In other words, the digital divide is an inequality in access to DTS and perceptions of opportunities. Hence, the digital divide perceived by users as inequality in access to information will ultimately negatively affect users' intentions.

In this study, it is assumed that the perceived interactivity for DTS will have a positive effect on the intention to use through the perceived usefulness. At this time, the intention to use can be negatively adjusted due to the digital divide.

Therefore, it can be assumed that the influence of perceived interactivity for DTS on the intention to use through perceived usefulness will be controlled by the influence of the digital divide.

H7: The effect of perceived interactivity about DTS on intention to use via perceived usefulness will be negatively moderated by digital divide.

H7-1: The effect of perceived communication about DTS on intention to use via perceived usefulness will be negatively moderated by digital divide.

H7-2: The effect of perceived control about DTS on intention to use via perceived usefulness will be negatively moderated by digital divide.

H7-3: The effect of perceived responsiveness about DTS on intention to use via perceived usefulness will be negatively moderated by digital divide.

3. Research model and experimental design

3.1 Research model

This study analyzed elements of perceived interactivity of DTS, perceived usefulness, perceived ease of use, intention to use, respectively. This study intended to identify that digital divide has moderated mediating effect in the effect of perceived interactivity of DTS on intention to use via the mediation of perceived usefulness. Based on the above hypothesis and the TAM of Davis (1989)[11], Venkatesh & Davis (2000)[15], Lu, Lai & Liu (2019)[13], the research model shown in Figure 1 was derived.

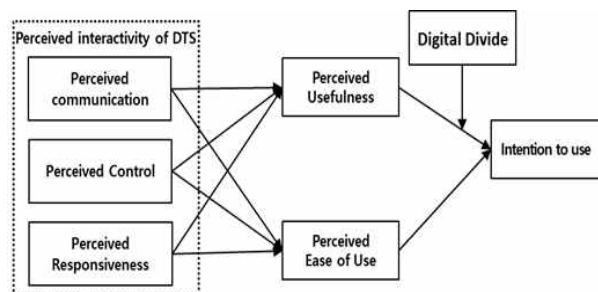


Fig. 1. The research model

3.2 Experimental design and general characteristics of the sample

Independent variables of this study are three elements of perceived interactivity: perceived communication, perceived control, and perceived responsiveness [13]. Mediating variables are perceived usefulness and perceived ease of use, and moderating variable is digital divide. Dependent variable is intention to use. This study used only the scales which have proved to be proper for the following variables: perceived interactivity [13], perceived usefulness [18], perceived ease of use [18], intention to use [17,18], digital divide [22,23]. To test the hypotheses, this study conducted a survey.

This study was conducted from February 8 to March 16, 2021 using paper questionnaires and online Google questionnaires. Among the collected 324 copies of the questionnaire, 304 were used for final analysis excluding 20 which had not been sincerely filled out or had other problems. The demographic characteristics of respondents are shown in Table 1.

Table 1. Demographic characteristics of the sample

Classification		Frequency (No.)	Proportion (%)
Gender	Female	105	34.5
	Male	199	65.4
Age	under 20s	36	11.8
	21~30s	86	28.2
	31~40s	111	36.5
	50s and above	71	23.3
Education	high school	21	6.9
	college or higher	182	59.8
	Graduate or higher	101	33.2

The general characteristics of respondents were as follows: In education level, most of them (92.7%) were college students or college graduates or above; 93.5% of respondents understood the meaning of DTS.

3.3 Exploratory element analysis and reliability test

Research was based on the user's experience with DTS, this study analyzed the correlation between the variables used. Based on existing researches, this study did element analysis on variables and reliability tests of them. The results are as follows. The measure of perceived interactivity for DTS was borrowed from a study by Lu, Lai & Liu (2019) [13]. Perceived interactivity to DTS is composed of three elements. Three measurement items (problem solving, effective feedback, two-way communication) of perceived communication were revised to fit interactivity to DTS and re-structured (Cronbach's $\alpha = 0.818$). Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'.

Four measurement items (knows to use, know clearly, choose freely, control over user experience) of perceived control were revised to fit interactivity to DTS and re-structured (Cronbach's $\alpha = 0.929$). Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'. And, three measurement items (quickly, very fast, get instantaneous information) of perceived responsiveness were also revised to fit interactivity to DTS and re-structured (Cronbach's $\alpha = 0.854$) [13]. Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'. Measures of perceived usefulness, perceived ease of use, and intention to use were borrowed from the study of Venkatesh & Davis (2000) [18]. Three measurement items (improves performance, increases productivity, enhances effectiveness) of

perceived usefulness were revised to fit the element mediating interactivity to DTS (Cronbach's $\alpha = 0.852$). Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'.

Four measurement items (clear and understandable, not require a lot of effort, easy to use, find easy) of perceived ease of use were revised to fit the element mediating interactivity to DTS (Cronbach's $\alpha = 0.903$). [18] Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'.

For the variable intention to use, three measurement items (continue using, try to use, plan to continue to use) were used. (Cronbach's $\alpha = 0.883$) [18]. Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'. The measure of the digital divide was borrowed from the work of Bélanger & Carter (2009) and Chang, Shahzeidi, Kim, & Park (2012) [22,23]. Five measurement items Opportunities for using DTS, hours of use, opportunities to connect, access to information, processing power) of Digital divide were revised to fit moderated mediating effect, and restructured (Cronbach's $\alpha = 0.883$) [22]. Respondents were asked to choose from 7-point Likert scale ranging from 1='Not at all' to 7='Definitely yes'. Element analysis showed that all the Cronbach's α s were over 0.80, demonstrating that reliability and validity of major variables are satisfactorily.

4. Empirical analysis

4.1 Correlation analysis

To examine the relationship, directionality, and possibility of multi-collinearity among variables, this study calculated Pearson's product moment correlation coefficients. In general, if correlation coefficient is over .80, we can suspect multi-collinearity. As shown in Table 2, all the

correlation coefficients among variables were below .80. And, all the correlations were significant at 0.01 level.

Table 2. Correlation analysis

factor	M	SD	Inter-Construct Correlations						
			PCO	PC	PR	PEU	PU	DD	IU
PCO	5.143	1.154	1						
PC	5.368	1.157	.573**	1					
PR	5.545	1.120	.674**	.666**	1				
PEU	5.706	1.028	.686**	.666**	.794**	1			
PU	5.396	1.066	.589**	.597**	.686**	.759**	1		
DD	5.403	1.130	.422**	.688**	.526**	.551**	.461**	1	
IU	5.903	1.037	.523**	.614**	.594**	.629**	.569**	.670**	1

Abbreviations: PCO, Perceived communication; PC, Perceived Control; PR, Perceived Responsiveness; PU, Perceived Usefulness; PEU, Perceived Ease of Use; DD, Digital Divide; IU, Intention to use
 *** p < .001, ** p < .01, * p < .05

4.2 Hypothesis test

4.2.1 Test of hypothesis 1

To examine mutual effects among variables, this study did multivariate regression analysis. Interactivity to DTS was found to have significantly and positively related with perceived usefulness (F=109.896, p<0.005, R² 51.9%). So, hypothesis 1 that Interactivity to DTS will have positive effect on perceived usefulness was adopted. All three independent variables belonging to Interactivity to DTS category were found to have significant and positive effects on perceived usefulness: perceived communication (B=.183, t=3.313, p<.005), perceived control

Table 3. The effect of perceived interactivity on perceived usefulness

Dependent Variable	Independent Variable	SE	B	t	P	VIF
	constant	.233		5.385	.000	
	PCO (H2-1)	.051	.183	3.313	.001	.518
PU	PC (H2-2)	.051	.211	3.850	.000	.528
	PR (H2-3)	.058	.422	6.935	.000	.429
R=.724, R ² =.524, adjusted R ² =.519 F=109.896, P=.000, Durbin-Watson= 2.074						

($B=0.211$, $t=3.850$, $p<0.001$), and perceived responsiveness ($B=0.422$, $t=6.936$, $p<0.001$). So, all the sub-hypotheses (H1-1, H1-2, H1-3) were adopted as shown in Table 3.

4.2.2 Test of hypothesis 2

As shown in Table 4, the interactivity to DTS were found to have significant and positive effects on perceived ease of use ($F=224.728$, $p<0.005$, R^2 68.9%). So, hypothesis 2 was adopted. All three independent variables belonging to Interactivity to DTS category were found to have significant and positive effects on perceived ease of use: perceived communication ($B=0.233$, $t=5.244$, $p<0.001$), perceived control ($B=0.194$, $t=4.399$, $p<0.001$), and perceived responsiveness ($B=0.507$, $t=10.373$, $p<0.001$). So, all the sub-hypotheses (H2-1, H2-2, H2-3) were adopted as shown in Table 4.

Table 4. The effect of perceived interactivity on perceived usefulness

Dependent Variable	Independent Variable	SE	B	t	P	VIF
PEU	constant	.181		6.239	.000	
	PCO (H1-1)	.040	.233	5.244	.000	.518
	PC (H1-2)	.039	.194	4.399	.000	.528
	PR (H1-3)	.045	.507	10.373	.000	.429
R=.832, R ² =.692, adjusted R ² =.689 F=224.728, P=.000, Durbin-Watson= 2.007						

4.2.3 Test of hypotheses 3 and 4

Hypothesis 3 is that perceived usefulness would have positive (+) effect on intention to use. Regression analysis proved that the relationship between two variables was significant ($B=0.215$, $t=3.180$, $p<0.005$). So, hypothesis 3 was adopted. Hypothesis 4 was that perceived ease of use would have positive (+) effect on intention to use. Regression analysis proved that the relationship between two variables was significant ($B=0.466$, $t=6.893$,

$p<0.005$). So, hypothesis 4 was adopted. The regression model was statistically significant ($F=107.156$, $p<0.005$). R^2 had 41.2% explanatory power. Durbin-Watson was 1.901, which means that there was no correlation between residuals. Thus, the regression model proved to be proper (See Table 5).

Table 5. The effects of perceived usefulness and perceived ease of use on intention to use

Dependent Variable	Independent Variable	SE	B	t	P	VIF
IU	constant	.264		7.903	.000	
	PU (H3)	.066	.215	3.180	.002	.424
	PEU (H4)	.068	.466	6.893	.000	.424
R=.645, R ² =.416, adjusted R ² =.412 F=107.156, P=.000, Durbin-Watson= 1.901						

4.2.4 Test of hypothesis 5

Table 6. Bootstrapping test of mediation effect of perceived usefulness

Path	B	SE	t	p	95% confidence interval	
					LLCI	ULCI
Total Effects						
PCO → PU	.169	.051	3.312	.001	.069	.270
PCO → IU	.128	.053	2.290	.017	.022	.233
PC → PU	.194	.051	3.850	.000	.095	.294
PC → IU	.323	.053	6.107	.000	.219	.427
PR → PU	.401	.058	6.935	.000	.288	.515
PR → IU	.239	.061	3.950	.000	.120	.359
PU → IU	.189	.059	3.180	.002	.172	.306
Path Coefficients						
PCO → PU	.169	.051	3.312	.001	.069	.270
PU → IU	.096	.057	1.784	.075	-.009	.201
PC → PU	.194	.051	3.850	.000	.095	.294
PU → IU	.286	.053	5.361	.000	.181	.391
PR → PU	.401	.058	6.935	.000	.288	.515
PR → IU	.163	.064	2.540	.012	.037	.290
PU → IU	.189	.059	3.180	.002	.172	.306

To test mediation effect of perceived usefulness in the effect of interactivity to DTS on intention to use, this study used bootstrapping applying SPSS Process Macro (Hayes, 2013) [24]. Using Process Model 4 of SPSS, this study analyzed it, and the results of repetition of 5,000

times are shown in Table 6.

The significance tests of different paths were as follows. Perceived communication in Path Coefficients had significant and positive (+) effect on perceived usefulness (B=0.169, t=3.312, p<.005, CI[0.069~0.270]) and intention to use (B=0.169 t=3.312, p<0.005, CI[0.069~0.270]). However, the perceived usefulness in the direct effect was found to be completely mediated, including 0 in the intention to use (B=0.096, t=1.784, p>0.05, CI [-0.009~0.201]).

Perceived control had significant and positive effect on perceived usefulness (B=0.194, t=3.850, p<0.001, CI[0.095~0.294]) and intention to use (B=0.323 t=6.107, p<0.001, CI[0.219~0.427]). And, perceived responsiveness had significant and positive effect on perceived usefulness (B=0.401, t=6.935, p<0.001, CI[0.288~0.515]) and intention to use (B=0.239 t=3.950, p<0.001, CI[0.120~0.359]). Perceived usefulness had positive mediation effect on intention to use (B=0.189, t=3.180, p<0.005, CI[0.172~0.306]).

To find out whether the indirect effect of perceived usefulness is significant in the effect of perceived communication on intention to use, this study did bootstrapping, and the results are shown in Table 7.

Table 7. Bootstrapping test of indirect effect of perceived usefulness

Dependent Variable	Intervening Variable	Independent Variable	B	Boot SE	95% confidence interval	
					LLCI	ULCI
PCO	PU	IU	.032	.017	.006	.076
PC	PU	IU	.036	.018	.007	.075
PR	PU	IU	.076	.030	.022	.142

Bootstrapping tests showed that, as the path of perceived communication to intention to use via perceived usefulness does not include 0 in the 95% confidence interval of indirect effect, we can assume that the path is significant (B=0.032, CI[0.006~0.076]). The path of perceived control to intention to use via perceived usefulness also

does not include 0 in the 95% confidence interval of indirect effect, the path is significant, we can assume that the path is significant (B=0.036, CI[0.007~0.075]). So is the path of perceived responsiveness (B=0.076, CI[0.022~0.142]). Such findings mean that the mediating process in which interactivity to DTS raises perceived usefulness, which then affects intention to use is statistically significant.

Consequently, in the effect of interactivity to DTS on intention to use, the mediating effect of perceived usefulness was identified, allowing us to adopt H5 (H5-1, H5-2, H5-3).

4.2.5 Test of hypothesis 6

This study intends to analyze the effect of digital divide in the relationship between DTS interaction and intention to use via perceived usefulness. To test mediating effect of perceived ease of use in the effect of interactivity to DTS on intention to use, this study did bootstrapping applying SPSS Process Macro (Hayes, 2013) [24]. Using Process Model 4 of SPSS, this study analyzed it, and the results of repetition of 5,000 times are shown in Table 8.

Table 8. Bootstrapping test of mediating effect of perceived ease of use

Path	B	SE	t	p	95% confidence interval	
					LLCI	ULCI
Total Effects						
PCO → PEU	.208	.040	5.244	.000	.130	.286
PCO → IU	.128	.053	2.389	.017	.022	.233
PC → PEU	.172	.039	4.399	.000	.095	.250
PC → IU	.323	.053	6.107	.000	.219	.427
PR → PEU	.466	.045	10.373	.000	.377	.554
PR → IU	.239	.061	3.950	.000	.120	.359
PU → IU	.285	.076	3.732	.000	.134	.435
Path Coefficients						
PCO → PEU	.208	.040	5.244	.000	.130	.286
PU → IU	.069	.055	1.254	.211	-.039	.176
PC → PEU	.172	.039	4.399	.000	.095	.250
PU → IU	.274	.053	5.126	.000	.169	.379
PR → PEU	.466	.045	10.373	.000	.377	.554
PR → IU	.107	.069	1.544	.124	-.029	.243
PR → PEU	.285	.076	3.732	.000	.134	.435

The significance tests of different paths were as follows. Perceived communication had significant and positive (+) effect on perceived ease of use ($B=0.208, t=5.244, p<0.001, CI[0.130\sim0.286]$) and intention to use ($B=0.128, t=2.389, p<0.05, CI[0.022\sim0.233]$). However, the perceived ease of use in the direct effect was found to be completely mediated, including 0 in the intention of use ($B=0.069, t=1.254, p>0.05, CI[-0.039 \sim 0.176]$). Perceived control had significant and positive effect on perceived ease of use ($B=0.172, t=4.399, p<0.005, CI[0.095\sim0.250]$) and intention to use ($B=0.323, t=6.107, p<0.001, CI[0.219\sim0.427]$).

Perceived responsiveness had significant and positive effect on perceived ease of use ($B=0.446, t=10.373, p<0.001, CI[0.377\sim0.554]$) and intention to use ($B=0.239, t=3.950, p<0.001, CI[0.134\sim0.435]$). However, the perceived ease of use in the direct effect was found to be completely mediated, including 0 in the intention to use ($B=0.107, t=1.544, p>0.05, CI[-0.029 \sim 0.243]$).

Table 9. Bootstrapping test of indirect effect of perceived ease of use

Dependent Variable	Intervening Variable	Independent Variable	B	Boot SE	95% confidence interval	
					LLCI	ULCI
PCO	PEU	IU	.059	.024	.020	.114
PC	PEU	IU	.049	.020	.016	.095
PR	PEU	IU	.133	.044	.049	.222

The significance tests of different paths were as follows. The path of perceived communication on intention to use via perceived ease of use did not have 0 in its 95% confidence interval of indirect effect, which means the indirect effect is positively (+) significant ($B=0.059, CI[0.020\sim0.114]$). And the path of perceived on intention to use via perceived ease of use did not have 0 in its 95% confidence interval of indirect effect, which means the indirect effect is positively (+) significant ($B=0.056, CI[0.017\sim0.105]$). Also the path of perceived responsiveness on intention to

use via perceived ease of use did not have 0 in its 95% confidence interval of indirect effect, which means the indirect effect is positively (+) significant ($B=0.198, CI[0.106\sim0.296]$).

Consequently, in the effect of interactivity to DTS on intention to use, the mediating effect of perceived ease of use was identified, allowing us to adopt H6 (H6-1, H6-2, H6-3). Such results mean that the mediating process in which interactivity to DTS raises ease of use, which then affects ease of use is statistically significant

4.2.6 Test of hypothesis 7

Table 10. Test of moderated mediating effect of digital divide

Dependent Variable	Variable	B	SE	t	95% confidence interval	
					LLCI	ULCI
PU	constant	.073	.049	1.477	-.024	.170
	PCO	.544	.043	12.657	.459	.628
	R ² =.346, F(1,302)=160.222, p<0.001					
IU	constant	.030	.043	.701	-.054	.114
	PCO	.159	.043	3.697	.074	.244
	PU	.234	.047	4.922	.140	.328
	DD	.416	.040	10.201	.336	.497
	DD*PU	-.103	.030	-3.418	-.163	-.044
R ² =.570, F(4,299)=99.441, p<0.001						
PU	constant	.059	.049	1.204	-.037	.156
	PC	.550	.042	12.946	.466	.634
	R ² =.356, F(1,302)=167.6224, p<0.001					
IU	constant	.279	.043	.643	-.057	.113
	PC	.143	.052	2.723	.039	.247
	PU	.265	.046	5.691	.173	.357
	DD	.369	.049	7.443	.271	.467
	DD*PU	-.110	.030	-3.575	-.170	-.049
R ² =.570, F(4,299)=99.441, p<0.001						
PU	constant	.067	.044	1.514	-.020	.155
	PR	.653	.039	16.389	.574	.731
	R ² =.470, F(1,302)=268.620, p<0.001					
IU	constant	.028	.043	.661	-.056	.113
	PR	.180	.051	3.531	.079	.281
	PU	.214	.051	4.160	.112	.315
	DD	.401	.042	9.517	.318	.484
	DD*PU	-.099	.030	-3.261	-.159	-.039
R ² =.562, F(4,299)=95.956, p<0.001						

Next, to test moderated mediating effect of digital divide on perceived interactivity to DTS and perceived usefulness affecting intention to use, this study did bootstrapping using Process Model 14 proposed by Hayes (2013) [24]. This study repeated the sample 5,000 times, and set 95% confidence interval. As shown in Table 10, it did mean centering to minimize multicollinearity.

In the Interaction effect ($B=0.544, p<0.05$) which is the effect of perceived communication on perceived usefulness, both the effect of perceived usefulness on intention to use are positively (+) significant ($B=0.234, p<0.05$), and the interaction effect of perceived usefulness and digital divide are negatively (-) significant ($B=-0.110, CI[-0.170\sim-0.049]$).

In the interaction effect ($B=0.550, p<0.05$) which is the effect of perceived control on perceived usefulness, both the effect of perceived usefulness on intention to use are positively (+) significant ($B=0.265, p<0.05$), and the interaction effect of perceived usefulness and digital divide are negatively (-) significant ($B=-0.110, CI[-0.170\sim-0.049]$). In the interaction effect ($B=-0.653, p<0.05$) which is the effect of perceived responsiveness on perceived usefulness, both the effect of perceived usefulness on intention to use are positively (+) significant ($B=0.214, p<0.05$), and the interaction effect of perceived usefulness and digital divide are negatively (-) significant ($B=-0.099, CI[-0.159\sim-0.039]$). That is, H7 (H7-1, H7-2, H7-3) that the effect of interactivity to DTS on intention to use via perceived usefulness will be moderated by digital divide are adopted.

To test statistical significance of moderated mediating effect, this study did bootstrapping using specific values of moderating variable (-1SD, Mean, +1SD), and the results are shown in Table 11. It was found that the lower digital divide is, the higher the indirect effect of mediated moderation is. When digital divide is +1SD, perceived communication (LLCI=0.001,

ULCI=0.125) and perceived control (LLCI=0.007, ULCI=0.137) are significant, because both of them do not include 0 at 95% confidence interval. When digital divide is low, perceived usefulness mediates all the three elements of perceived interactivity to DTS. But, when digital divide is high (+1SD), the indirect effect of perceived responsiveness, among three elements of perceived interactivity to DTS, is not significant, meaning that mediating effect does not happen.

Table 11. Test of indirect effect bootstrapping in moderated mediating effect

Moderating variables			Indirect effect coefficient	BootSE	95% confidence interval	
					LLCI	ULCI
PCO		-1SD	.195	.046	.105	.287
→PU	DD	M	.116	.030	.060	.178
→IU		+1SD	.060	.031	.001	.124
PC		-1SD	.219	.044	.130	.300
→PU	DD	M	.134	.029	.079	.192
→IU		+1SD	.073	.032	.010	.139
PR		-1SD	.217	.058	.103	.332
→PU	DD	M	.127	.038	.053	.204
→IU		+1SD	.062	.037	-.011	.137

It was found that, in the mediating effect of three elements of interactivity to DTS on intention to use via perceived usefulness, the degree of digital divide was important. The lower digital divide is, the higher indirect effect is. So, when it is low, all the three elements were significant.

It means that, when digital divide is small or low, expectation on digital transformation will compensate for inconvenience felt by users. However, when digital divide is big, indirect effect is low or insignificant. Such a result can be understood that if digital divide is big, usefulness users fell becomes lower or disappears.

5. Conclusion

This study analyzed the relationship between

perceived interactivity to DTS and intention to use DTS using the psychological mechanism of the technology acceptance model. It found out that, when service is digitalized, perceived interactivity to DTS has positive and considerable effect on perceived usefulness and perceived ease of use, respectively. In addition, while perceived interactivity to DTS has positive (+) effect on intention to use via perceived usefulness, if digital divide is big, the effect becomes negative (-), it has statistically moderated effect.

Analysis of data has led to the following conclusions.

First, interactivity to DTS (perceived communication, perceived control, and perceived responsiveness) has positive effect on perceived usefulness and perceived ease of use. Then perceived usefulness and perceived ease of use have positive effect on intention to use. It means that the relationship between perceived interactivity for DTS and perceived usefulness and perceived ease of use is important element in expecting intention to use DTS.

Second, the positive mediating effect of perceived usefulness was confirmed in the relationship between perceived interaction for DTS and intention to use. And it was verified that the mediating effect of perceived usefulness on the intention to use was adjusted by the digital divided. In other words, even if the user knows the usefulness for DTS, if Intention to use is lowered when digital divide arise due to restrictions or speed of access to information by digital devices.

Third, the bootstrapping test of indirect effect in moderated mediating effect proved that, if digital divide is small, the users who perceive that DTS is useful, they intend to use it in the future. In other words, when digital divide is small, while the mediating effect of perceived usefulness is maintained between perceived interactivity to DTS and intention to use, if the digital divide gets too big for users can accept,

usefulness users perceive on DTS gets smaller or disappears.

The analysis proved that perceived interactivity to DTS is an important element in determining intention to use it. In addition, such a causal relationship should be mediated by perceived usefulness, and intention to use DTS varies by digital divide. The findings suggest some theoretical and practical hints to companies and governments preparing for the 4th Industrial Revolution.

What the companies which want to dominate the market by providing customers with DTS should pay attention to is that, even in the conditions where there is the divide in technology and uncertainty about the technology in the initial stage of technological development, consumers acutely perceive. This suggests that if the perceived information gap is large, the perceived usefulness of the technology decreases or disappears, so it is necessary to induce consumers' information access and fill the digital divide. In addition, to facilitate the transition to the digital age, governments need to work to reduce digital access inequality among people. The results of this study are expected to give some hints for businesses and governments to formulate business strategies and policies related to DTS.

In spite of such good points of this study which can serve as suggestions to companies and government decision makers, this study has the following limits.

This study failed to consider the relationship between demographic characteristics of respondents such as gender and income levels and digital divide. In the future research, it is necessary to delve into the effect of such demographic characteristics on digital divide. And this study only analyzed the path of perceived usefulness and its correlation with digital divide. Consequently, it is necessary in future researches to analyze the relationship

between the path of ease of use and digital divide to have more various interpretation on DTS.

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