**The Effect of Perceived Interactivity to DTS (Digital Transformation of Services) on Intention to use**

**: Focusing on the Technology Acceptance Model (TAM)**

Dong-Yub Lee[1], Gwi-Gon Kim*[2]

[1]Ph.D. student, Department Consulting, Kumoh National Institute of Technology, Republic of Korea

*[2] Professor, Business Administration, Kumoh National Institute of Technology, Republic of Korea

mingo21@daum.net[1], metheus@kumoh.ac.kr*[2]

Corresponding author[*]: mobile Phone: +82-010-2085-5643, metheus@kumoh.ac.kr

**Abstract**

**Background/Objectives**: Recently, with the covid-19 pandemic, a lot of services are being changed into digital service. This study intended to examine the effect of perceived interactivity to DTS (digital transformation of services) on intention to use it. In particular, this study examined moderated mediating effect of digital divide. To analyze the data, this study applied TAM (Technology Acceptance Model).

**Methods/Statistical analysis**: This study performed a questionnaire survey to 324 college and graduate school students and common people living in Korea. Excluding 20 copies which were filled out improperly or insincerely, this study finally used 304 copies for analysis. To test hypotheses, this study applied multivariate regression analyses, and bootstrapping to examine moderated mediating effects.

**Findings**: The findings of data analysis are as follows. First, three elements of perceived interactivity to DTS (perceived communication, perceived control, and perceived responsiveness) have positive effects on both perceived usefulness and perceived ease of use. Second, both perceived usefulness and perceived ease of use have positive effect on intention to use. Third, the effect of three elements of perceived interactivity to DTS on intention to use DTS is mediated by perceived usefulness and perceived ease of use. Forth, the effect of perceived interactivity to DTS on intention to use via perceived usefulness is moderated by digital divide.

**Improvements/Applications**: This study showed that perceived interactivity to DTS is an important element in deciding intention to use it. In addition, it also proved that the effect is mediated by perceived usefulness and perceived ease of use. Such findings suggest that, to raise intention to use DTS among people, it is necessary to secure perceived usefulness and perceived ease of use. Meanwhile, as intention to use DTS varies depending on digital divide, it is necessary to reduce the divide.

**Keywords:** TAM (Technology Acceptance Model), Digital Transformation, DTS (Digital Transformation of Services), Digital divide, Perceived interactivity

## 1. Introduction

In the first era of the fourth industrial revolution of mankind, steam power was an innovative technology that changed the world. In the 2nd Industrial Revolution, efficient technology through assembly lines gave birth to new innovations, and in the 3rd Industrial Revolution, computers took over. Now in the Fourth Industrial Revolution, digital is an innovative technology. Advances in digital technologies such as AI, digital education, Internet of Things (IoT) networks, virtual reality, advanced analytics, and digital payments are fundamentally changing the way digital users interact with the world.

In the transfer of information, in the past, documents and images were shared on paper and made by hand. However, with the development of digital technology, digitalization is actively progressing with the commercialization of e-mail and document automation programs through computers and the Internet. These changes are driving the digital transformation of business and society by competitively introducing more useful and more relevant hardware and software solutions. This digital transformation means radically redesigning the customer experience and business model into a digital culture and digital business.

Through digital transformation, users and businesses can generate revenue, improve efficiency, and create new value through digital use. However, converting traditional services to digital requires improving the user's experience and meeting the needs of the user as desired. In other words, it is possible to meet expectations and increase the intention of use through useful and convenient services that meet the expectations of users. This digital transformation will fundamentally change our society and daily life by transforming the traditional man-to-human service interaction into human-to-digital service interaction [1]. In a 2011 report by the IBM Institute for Enterprise Value, digital transformation was defined as "a business strategy that combines digital and physical components to create new business models and set new directions for the industry" [2]. 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"[3].
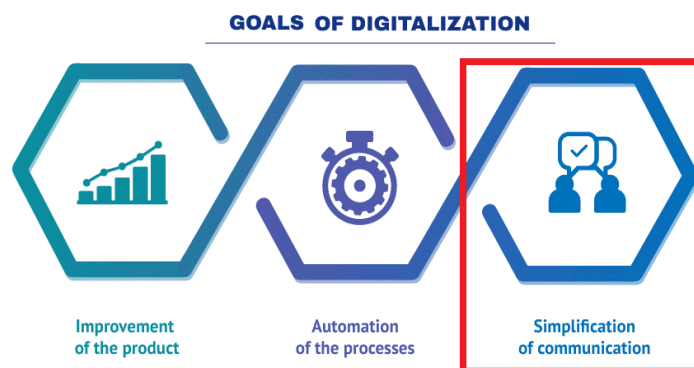


**Figure 1. Goals of digital transformation**

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 [4, 5]. As shown in Figure 1, goals of digital transformation can be categorized into three types: improvement of the product, automation of the process, and simplification of communication [6]. This study defines the category of 'simplification of communication', interface of customers and digital service, as DTS (Digital Transformation of Service).

**Figure 2. Digital transformation of service case**

As shown in Figure 2, 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, this study was conducted to investigate the effects of the interacting elements of DTS and usefulness and conveniences of using DTS on willingness to use it. Meanwhile, rapid change of service into digitalization has led to digital inequality [7, 8]. 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. It has been widely used in information system area. TAM contains specific beliefs on perceived usefulness and perceived ease of use [9].

Perceived usefulness is the degree to which users perceive that a new information technology and service will improve behavior and improve business performance. Perceived ease of use is the degree to which user perceives 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 [9].

### 2.2. Perceived interactivity on DTS and TAM

Interaction is communication between humans and other humans or things. In the digital economy, interactivity can be understood as actions and reactions to new digital services, 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 [7,10]. According to Lu, Lai & Liu (2019), interaction felt by digital service user has positive effect on willingness to use it [10]. 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 [1,11].

Perceived communication, one of the three elements of interaction, is the degree to which user believes that it facilitates two-way communication through a digital system or medium [7]. DTS has interactivity through problem solving, effective Feedback, two-way communication. Thus, perceived communication provides strong interaction in digital service [10].

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 [11]. 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[10].

Perceived responsiveness is perceived responsiveness of digital service to the user's action [11]. Digital service user expects that he or she can get instant information and quick response and answer [10].

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 [10]. Therefore, to examine intention of DTS user, this study that three elements of perceived interactivity for DTS are explained them as precedent element s 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 [9,12]. 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 element s of interaction (perceived communication, perceived control, and perceived responsiveness) have positive effects on perceived usefulness via perceived ease of use [10]. This study, assuming that three element s 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 [9,12]. And Lu, Lai & Liu (2019) identified that there is significant relationship between interaction and perceived ease of use of digital device. This study found that three factors of interaction (perceived communication, perceived control, and perceived response) positively influence perceived ease of use [10]. Therefore, assuming that three element s of perceived interactivity will have positive effect on perceived ease of use, this study set the following hypotheses.

**H2: Perceived interactivity on DTS will have positive effect on perceived ease of use.**

H2-1: Perceived communication on DTS will have positive effect on perceived ease of use.

H2-2: Perceived control on DTS will have positive effect on perceived ease of use.

H2-3: 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 [10,12,13].

**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 [10,13]. Based on such previous findings, this study set the following hypotheses about the mediating effect of perceived usefulness on three element s 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

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. In addition, some people who do not have access to the Internet and other information and communication technologies are concerned that they will be penalized because they cannot learn the necessary skills to shop online, search for information online, or work with technology. So, gap in access to and use of digital information is increasing [8].

Those who are difficult in access to, understanding and use of digital data are in disadvantageous positions in recruitment, trust, insurance, and medical care [8].

At first, it was thought that the digital divide phenomenon was mainly due to the difference in initial and distance
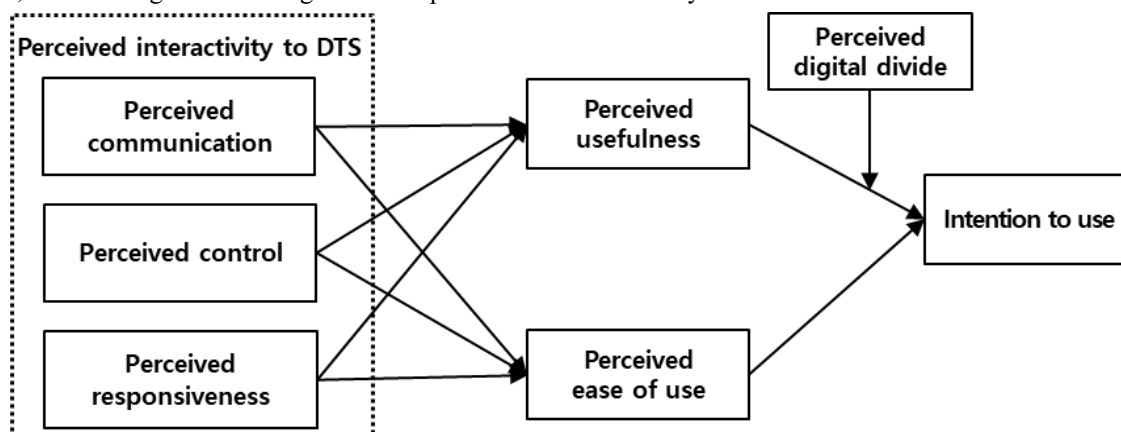


to use the Internet or PC for economic and geographical reasons, but more recently it is based on the degree of information utilization between digital users and IT. It is interpreted that a gap has occurred according to the accessibility perceived by the user. As a result, it can be interpreted as creating a digital gap and uneven distribution of access, use, and impact of information and communications technology (ICT). Access and search, learning opportunities and experiences, opportunities to use, and easy-to-use environments can account for the information gap in terms of digital access, real-time use, and effective adoption methods.

According to Bélanger & Carter (2009), the digital divide means with and without information access. [14]. Chang, Shahzeidi, and Kim & Park (2012) viewed Access and Online Participation as major variables in Measurement Items for Digital divide [15]. 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. 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. 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 hypotheses, we can draw the research model as Figure 3 below.

**Figure 3. The research model**

### 3.2. Experimental design and general characteristics of the sample

Independent variables of this study are three element s of perceived interactivity: perceived communication, perceived control, and perceived responsiveness [10]. 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 [10], perceived usefulness [13], perceived ease of use [13], intention to use [12,13], digital divide [14,15]. 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 | 20s | 36 | 11.8 |
| | 30s | 86 | 28.2 |
| | 40s | 111 | 36.5 |
| | 50s and above | 71 | 23.3 |
| Education | High school graduates or below | 21 | 6.9 |
| | College students and graduates | 182 | 59.8 |
| | Graduate school or above | 101 | 33.2 |
| Monthly income | Less than 2 million won | 18 | 5.9 |
| | 2 mil. won ~ 3.5 mil won | 84 | 27.6 |
| | 3.5 mil won ~ 5 mil. won | 84 | 27.6 |
| | 5 mil. won ~ 6.5 mil. won | 47 | 15.4 |
| | 6.5 mil. won ~ 8 mil. won | 23 | 7.6 |
| | Above 8 mil. won | 48 | 15.7 |

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

The Effect of Perceived Interactivity to DTS (Digital Transformation of Services) on Intention to use
: Focusing on the Technology Acceptance Model (TAM)

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) [10]. 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 α = .818).

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 α = .929).

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 α = .854) [10].

Measures of perceived usefulness, perceived ease of use, and intention to use were borrowed from the study of Venkatesh & Davis (2000) [13]. Three measurement items (improves performance, increases productivity, enhances effectiveness) of perceived usefulness were revised to fit the element mediating interactivity to DTS (Cronbach's α = .852).

Four measurement items (easy to use, clear and understandable, not require much effort, easy to find) of perceived ease of use were revised to fit the element mediating interactivity to DTS (Cronbach's α = .903) [13].

The measure of the variable intention to use was borrowed from the work of Venkatesh, Thong & Xu (2012) and Venkatesh & Davis (2000) [12,13]. Three measurement items (continue using, try to use, plan to continue to use) were used. (Cronbach's α = .883).

The measure of the digital divide was borrowed from the work of Bélanger & Carter (2009) and Chang, Shahzeidi, Kim, &Park (2012) [14,15]. Five measurement items (infrastructure for DTS, easy to use, experience and learning opportunities, access to information, purchase opportunities using DTS) of Digital divide were revised to fit moderated mediating effect, and restructured (Cronbach's α = .883).

For all measurement, respondents were asked to choose from a 7-point likert scale ranging from 1 ='not at all' to 7 ='definitely yes'. And element analysis showed that all the Cronbach's α s were over .80, demonstrating that reliability and validity of major variables are satiselementy.

## 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**

| element | M | SD | Inter-Construct Correlations | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | PCO | PC | PR | PEU | PU | DD | IU |
| PCO | 5.1436 | 1.15415 | 1 | | | | | | |
| PC | 5.3684 | 1.15718 | .573** | 1 | | | | | |
| PR | 5.5450 | 1.12028 | .674** | .666** | 1 | | | | |
| PEU | 5.7064 | 1.02885 | .686** | .666** | .794** | 1 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PU | 5.3969 | 1.06636 | .589** | .597** | .686** | .759** | 1 | |
| DD | 5.4033 | 1.13072 | .422** | .688** | .526** | .551** | .461** | 1 |
| IU | 5.9035 | 1.03771 | .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 (B=.211, t=3.850, p<.001), and perceived responsiveness (B=.422, t=6.936, p<.001). So, all the sub-hypotheses (H1-1, H1-2, H1-3) were adopted as shown in Table 3.

**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 (H1-1) | .051 | .183 | 3.313 | .001 | .518 |
| PU | PC (H1-2) | .051 | .211 | 3.850 | .000 | .528 |
| | PR (H13) | .058 | .422 | 6.935 | .000 | .429 |
| | R=.724, R²=.524, adjusted R²=.519 | | | | | |
| | F=109.896, P=.000, Durbin-Watson= 2.074 | | | | | |

### 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, R² 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=.233, t=5.244, p<.001), perceived control (B=.194, t=4.399, p<.001), and perceived responsiveness (B=.507, t=10.373, p<.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 | DE | B | t | P | VIF |
|---|---|---|---|---|---|---|
| PEU | constant | .181 | | 6.239 | .000 | |

| | | | | | |
|---|---|---|---|---|---|
| PCO (H2-1) | .040 | .233 | 5.244 | .000 | .518 |
| PC (H2-2) | .039 | .194 | 4.399 | .000 | .528 |
| PR (H2-3) | .045 | .507 | 10.373 | .000 | .429 |

R=.832, R²=.692, adjusted R²=.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=.215, t=3.180, p<.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=.466, t=6.893, p<.005). So, hypothesis 4 was adopted. The regression model was statistically significant (F=107.156, p<.005). R² 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 | DE | B | t | P | VIF |
|---|---|---|---|---|---|---|
| | constant | .264 | | 7.903 | .000 | |
| IU | PU (H3) | .066 | .215 | 3.180 | .002 | .424 |
| | PEU (H4) | .068 | .466 | 6.893 | .000 | .424 |

R=.645, R²=.416, adjusted R²=.412

F=107.156, P=.000, Durbin-Watson= 1.901

### 4.2.4. Test of hypothesis 5

To test mediation effect of perceived usefulness in the effect of interactivity to DTS on intention to use, this study used bootsrapping applying SPSS Process Macro (Hayes, 2013) [16]. Using Process Model 4 of SPSS, this study analyzed it, and the results of repetition of 5,000 times are shown in Table 6.

**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 |

<div align="center">Path Coefficients</div>

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PCO | → | PU | .169 | .051 | 3.312 | .001 | .069 | .270 |
| PCO | → | IU | .096 | .057 | 1.784 | .075 | -.009 | .201 |
| PC | → | PU | .194 | .051 | 3.850 | .000 | .095 | .294 |
| PC | → | 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 |

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<.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>.05, CI [-0.009~0.201]).

Perceived control had significant and positive effect on perceived usefulness (B=0.194, t=3.850, p<.001, CI[0.095~0.294]) and intention to use (B=0.323 t=6.107, p<.001, CI[0.219~0.427]).

And, perceived responsiveness had significant and positive effect on perceived usefulness (B=0.401, t=6.935, p<.001, CI[0.288~0.515])and intention to use (B=0.239 t=3.950, p<.001, CI[0.120~0.359]). Perceived usefulness had positive mediation effect on intention to use (B=0.189, t=3.180, p<.005, CI[0.172~0.306]).

In other words, it can be seen that the intention to use DTS arises only when the user feels that completely mediated communication is useful.

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 bootsrapping, and the results are shown in Table 7.

<div align="center">**Table 7. Bootstrapping test of indirect effect of perceived usefulness**</div>

| Dependent Variable | Intervening Variable | Independent Variable | B | BootSE | 95% confidence interval | |
|---|---|---|---|---|---|---|
| | | | | | boot LLCI | boot 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 bootsrapping applying SPSS Process Macro (Hayes, 2013) [16]. 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 |
| PEU | → | IU | .285 | .076 | 3.732 | .000 | .134 | .435 |
| Path Coefficients | | | | | | | | |
| PCO | → | PEU | .208 | .040 | 5.244 | .000 | .130 | .286 |
| PCO | → | IU | .069 | .055 | 1.254 | .211 | -.039 | .176 |
| PC | → | PEU | .172 | .039 | 4.399 | .000 | .095 | .250 |
| PC | → | 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 |
| PEU | → | IU | .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<.001 CI[0.130~0.286]) and intention to use (B=0.128 t=2.389, p<.05, CI[0.022~0.233]). 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> .05, CI [-0.039 ~ 0.176]).

Perceived control had significant and positive effect on perceived ease of use (B=0.172, t=4.399, p<.005, CI[0.095~0.250]) and intention to use (B=0.323 t=6.107, p<.001, CI[0.219~0.427]).

Perceived responsiveness had significant and positive effect on perceived ease of use (B=0.446, t=10.373, p<.001, CI[0.377~0.554]) and intention to (B=0.239, t=3.950, p<.001, CI[0.134~0.435]). 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> .05, CI [-0.029 ~ 0.243]).

In other words, it can be seen that the intention to use the DTS occurs only when the user feels that the communication and control that is completely mediated is easy.

This study did bootsrapping test of indirect effect of perceived ease of use and the results are shown in Table 9.

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

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

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[0.020~0.114]). 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[0.017~0.105]). 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[0.106~0.296]).

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

Next, to test moderated mediating effect of digital divide on perceived interactivity to DTS and perceived usefulness affecting intention to use, this study did bootsrapping using Process Model 14 proposed by Hayes (2013) [16]. This study repeated the sample 5,000 times, and set 95%confidence interval. As shown in Table 10, it did mean centering to minimize multicollenearity.

### Table 10. Test of moderated mediating effect of digital divide

| Dependent Variable | Variable | B | SE | t | 95% confidence interval | |
|---|---|---|---|---|---|---|
| | | | | | boot LLCI | boot ULCI |
| PU | constant | .073 | .049 | 1.477 | -.024 | .170 |
| | PCO | .544 | .043 | 12.657 | .459 | .628 |
| | R²=.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 |

The Effect of Perceived Interactivity to DTS (Digital Transformation of Services) on Intention to use

: Focusing on the Technology Acceptance Model (TAM)

|  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
|  | DD*PU | -.103 | .030 | -3.4187 | -.163 | -.044 |
|  | R²=.570, F(4,299)=99.441, p<0.001 | | | | | |
| PU | constant | .059 | .049 | 1.2042 | -.037 | .156 |
|  | PC | .550 | .042 | 12.946 | .466 | .634 |
|  | R²=.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 | 7.4430 | .271 | .467 |
|  | DD*PU | -.110 | .030 | -3.575 | -.170 | -.049 |
|  | R²=.570, F(4,299)=99.441, p<0.001 | | | | | |
| PU | constant | .067 | .044 | 1.514 | -.020 | .155 |
|  | PR | .653 | .039 | 16.389 | .574 | .731 |
|  | R²=.470, F(1,302)=268.620, p<0.001 | | | | | |
| IU | constant | .028 | .043 | .6617 | -.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 |
|  | R²=.562, F(4,299)=95.956, p<0.001 | | | | | |

In the Interaction effect (B=0.544, p<.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<.05), and the interaction effect of perceived usefulness and digital divide are negatively (-) significant (B=-0.110, CI[-0.170~-0.049]).

In the interaction effect (B=0.550, p<.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=.265, p<.05), and the interaction effect of perceived usefulness and digital divide are negatively (-) significant (B=-0.110, CI[-0.170~-0.049]).

In the interaction effect (B=-0.653, p<.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<.05), and the interaction effect of perceived usefulness and digital divide are negatively (-) significant (B=-0.099, CI[-0.159~-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.

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

| **Moderatin** | **Indirect effect** | **BootSE** | **95% confidence interval** |
|---|---|---|---|

| | gvariable | | coefficient | | boot LLCI | boot 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 the lower digital divide is, the higher the indirect effect of mediated moderation is. When digital divide is +1SD, perceived communication (LLCI=.001, ULCI=.125) and perceived control (LLCI=.007, ULCI=.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.

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 divied. This means that 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. In other words, 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 usefulness of instant provision of information, but that, if perceived digital divide is big, usefulness they perceive on the technology bets smaller or disappears. Consequently, it is necessary for companies to lead consumers to be able to get access to information and reduce the digital divide. To facilitate the change into the digital age, governments also need to make efforts to reduce inequality in digital access among people. In particular, it is necessary to analyze the inequality caused by the digital divide caused by digital conversion, and to analyze the impact of users who accept digital conversion, so that the user accepts the digital conversion and feels useful. These efforts can accelerate digital transformation. And to do this, you need to maximize the digital benefits of users. Maximizing users' digital benefits includes making them useful and easy to use through improved interactions with digital operators, user accessibility and data control, and improved education and training systems.

How to improve data accessibility through this is of paramount importance. In addition, it is necessary to support enterprises to realize digital transformation, to spread the useful services of enterprises and to promote them to utilize digitally and efficiently use them. The findings suggest some theoretical and practical hints to companies and governments preparing for the 4th Industrial Revolution.

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.

## 6. Acknowledgment

## 7. References

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