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Impacts of user beliefs and privacy on intention to use AI robots in real life

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ABSTRCT

This study investigated the antecedents that influence users' acceptance of robots as they appear in daily life. The data used in the analysis is the 2022 Intelligent Information Society User Panel Survey data. As a result of the analysis, there was no difference in gender in the demographic variables used as control variables, and users in the younger age group showed a high intention to use robot technology. Beliefs about the usefulness of robots were found to increase the intention to use robot technology. Among robot commercialization beliefs, beliefs about the commercialization of baby care robots and disabled care robots were found to lower the intention to use robot technology. On the other hand, student education robots and construction site work robots were found to increase the intention to use robot technology. In the case of future privacy protection beliefs, beliefs about future expansion of privacy exposure were found to increase the intention to use robot technology. These results provide academic implications on the role of beliefs in

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consumer acceptance of robots awaiting future commercialization and also provide implications for practical preparation.

Keywords: usefulness beliefs, commercialization beliefs, privacy beliefs, and robot use intention

INTRODUCTION

The use of robots in daily life is increasing. Robots that perform difficult tasks on behalf of humans in industrial settings were already in use. Now, robots are infiltrating our daily lives and taking over human work. Robots serving people in restaurants have now become a familiar sight. Even at airports, robots are performing the function of providing necessary information to passengers. As the manpower shortage is severe and labor costs are rising, non-face-to-face ordering has become routine, and serving robots working in restaurants are now not uncommon (Lee, July 15, 2024). Coexistence with robots is not something that only appears in movies; it has already become a reality. As the number of robots taking over human work in everyday life increases, it is now necessary to think about how humans can coexist with robots. The emergence of assistive robots that further overcome human limitations actively calls for discussion on the coexistence of humans and robots (Cho, October 28, 2023). Not only in practical terms, but also academic research on the coexistence of humans and robots needs to be conducted.

Humans may have various perceptions about robots. Basically, you can form a positive or negative attitude. There can be a positive evaluation in that it helps humans with their work and takes on tasks that are difficult for humans to do. This is mainly from the perspective of people who create added value using robots.

However, from the workers' perspective, there is also anxiety that robots may replace their labor force and take away human jobs. In particular, as robots begin to acquire sentience due to the development of artificial intelligence technology, human anxiety about them is intensifying (Lee, July 29, 2022). These various perceptions can be defined as beliefs about robots. In psychology, beliefs are an important factor affecting attitudes and behavior, and beliefs about robots can affect robot acceptance.

Beliefs about robots can largely be about how useful it will be to oneself. When a new technology emerges, the perception of usefulness of the technology is known to influence the intention to accept the technology (Davis, 1989). If the serving robots mentioned above perform tasks no different from human employees or are considered better than humans, the number of robot employees will increase further. Also, whether the use of robots is feasible is an issue. Technology develops rapidly, but commercialization often takes quite a long time. The cost of commercialization may be a problem, or the technology may be difficult to accept socially. If positive beliefs about the commercialization of technology are formed among users, technology acceptance can also progress rapidly. Lastly, the issue of personal information protection must be resolved. As digital technologies that interact with humans increase, concerns about personal information leaks are growing. News

of incidents involving personal information are also often reported in the media.

Therefore, the dissemination of technology will only occur when trust in privacy is supported.

This study focuses on people's perception of robots that are invading their daily lives. Specifically, this study created a research model to verify how human beliefs about robots affect robot acceptance. Users' beliefs include perceptions of usefulness, commercialization, and privacy about the technology. To verify the research model, data from the 2022 intelligent information society user panel survey was used. Such research can enhance understanding of consumer acceptance of new technologies and provide academic implications on technology acceptance.

LITERATURE REVIEW

Acceptance of robot technology

When a new technology emerges, factors that influence the intention to accept that technology are studied. With the advent of the digital age, the types of technologies have become more diverse, and a lot of research has been conducted specializing in individual technologies. Various studies have also been conducted to explain general technology acceptance. The theory of reasoned action (TRA) is the most traditional theory explaining technology acceptance (Fishbein & Ajzen, 1975).

Attitudes, subjective norm, and behavioral intention are key concepts in the theory of reasoned action. Later, the theory of reasoned action was expanded and the theory of planned behavior was developed (Ajzen, 1985). The theory of planned

behavior includes perceived behavioral control in addition to attitudes, subjective norms, and behavioral intentions.

Next, a technology acceptance model was developed (Davis, 1989). Perceived usefulness and perceived ease of use are the core concepts of the technology acceptance model. Perceived usefulness and perceived ease of use play a role in mediating external factors, attitudes, and acceptance intention in the technology acceptance model. The TAM is evaluated as an effective model in explaining the acceptance of new technology. However, despite the usefulness of the technology acceptance model, criticism arose about its two limited variables, and the extended technology acceptance model was introduced (Vekatech & Davis, 2000). Various modified versions of the technology acceptance model were later introduced, and the unified theory of acceptance and use of technology mode (UTAUT model) emerged, focusing on individual acceptance and integrating existing technology acceptance models (Venkatesh, Morris, Davis, & Davis, 2003). Performance expectancy, effort expectancy, social influence, and facilitating conditions are added to the integrated technology acceptance model.

Beliefs

Belief can be defined as an evaluation of whether the knowledge held about a specific object is correct or the probability that an event or state will occur (Eagly & Chaiken, 1998). Belief about the future means expectation. Even in the concept of belief, there is a difference between believing that an object itself exists (believe in)

and believing in the object (believe about). Therefore, one can believe in God or have freedom of speech as a belief. In the same sense, one can believe that God is not omnipotent or that freedom of speech is guaranteed by the Constitution. Believing in God means believing in the existence of God, and believing in freedom of speech means believing in the desirability of freedom of speech. Therefore, beliefs are subjective and can refer to judgments of truth or falsity (Wyer & Albarracin, 2005).

Traditionally, beliefs are known to influence attitudes (Kruglanski & Stroebe, 2005). However, beliefs often have a direct impact on behavior and behavioral intentions. The Health Belief Model (HBM), which is widely used in health communication, explains the impact of health-related belief variables such as perceived threat, perceived benefits, and perceived barriers on health behavior (Janz & Becker, 1984; Rosenstock, 1974). In the Value-Belief-Norm Theory (VBN Theory), beliefs are also proposed as an important antecedent factor explaining eco-friendly behavior (Stern, 2000). Perceived usefulness and easiness used in the technology acceptance model can also be defined as a belief about technology, and their influence on attitudes and behavioral intentions is suggested (Davis, 1989).

The impact of specific belief variables on behavioral intention has been continuously reported in existing empirical studies. Product attribute beliefs such as internal sensory attribute beliefs, internal functional attribute beliefs, and package and brand attribute beliefs also affect purchase intention (Wei, Park, & Guo, 2024). Beliefs about eco-friendliness are a major variable that affects the intention to purchase eco-friendly products (Wang, & Kim, 2023). The impact of beliefs about

technology on behavioral intentions has also been studied. In education using artificial intelligence, it is reported that beliefs about artificial intelligence have a positive effect on intention to accept technology (Yang, & Park, 2022). In this study, we will focus on the role of beliefs that influence technology acceptance, examine the level of beliefs in more detail, and discuss their influence.

Usefulness beliefs

In the technology acceptance model, perceived usefulness is a key mediating variable that affects attitude and behavioral intention along with perceived ease of use (Davis, 1989). Although both variables are proposed to influence attitude in the technology acceptance model, it is perceived usefulness that directly influences behavioral intention. Perceived ease of use influences behavioral intention by mediating perceived usefulness. Other studies on the technology acceptance model also suggest that perceived usefulness has more explanatory power than perceived ease of use.

This study aims to verify the influence of usefulness beliefs about robots on intention to use robot technology. This study would like to apply the relationship between usefulness and behavioral intention proposed in the technology acceptance model to the perception of robots. This study seeks to define perceived usefulness as a factor included in beliefs. In the technology acceptance model, research was conducted on various technologies to examine the influence of usability on acceptance intention along with ease of use. In addition to technology, research on

the relationship between usefulness and acceptance intention has been conducted on digital platforms. Perceived usefulness in online shopping malls appears to increase purchase intention for shopping mall products (Kim, & Park, 2013). In a study on artificial intelligence education, which is a recent study on the technology acceptance model, usefulness is defined as a belief, and perceived usefulness appears to have a positive effect on the intention to accept artificial intelligence education (Yang, & Park, 2022). In experiential marketing based on data intelligence, the perception of usefulness of identification technology has a positive effect on acceptance intention (Kim, 2022). Similar research on robots shows that the perceived usefulness of cleaning robots has a positive effect on consumer satisfaction and is linked to purchase intention (Lee, 2017). Therefore, based on the concept of usefulness as a belief proposed in previous research, this study propose the following hypothesis regarding the relationship between usefulness and behavioral intention in the technology acceptance model for robots.

Hypothesis 1: Robot usefulness beliefs will have a positive effect on intention to use robot technology.

Feasibility beliefs

Among the beliefs about robot technology, there is one about the feasibility of the technology itself. There is a clear difference between ideal and realistic. In this study, commercialization belief is a concept related to perceived behavioral control in

the theory of planned behavior. Perceived behavioral control is the belief that one can perform a specific behavior if he or she wants to (Ajzen, 1991). Although some robots are in service, in an industrial sense, robots are just under development and are not yet in full-scale practical use. Only limited sales are possible. This means that the general public is at a stage where robots are not recognized as a product. Therefore, we intend to use commercialization beliefs as an antecedent factor that enables perceived behavioral control.

The relationship between behavioral control and behavioral intention is supported in many studies, and its validity is also verified in research on technology. In research targeting electric vehicles, behavioral control over the acceptance of electric vehicles appears to have a positive effect on the intention to accept electric vehicles (Moon, 2019). Perceived control over airport-airline technology-based services also appears to have a positive effect on behavioral intention through experience evaluation (Moon & Kim, 2020). Based on the proposition that technology commercialization beliefs are a concept related to behavioral control, this study proposes the following hypothesis regarding the impact of robot commercialization beliefs on the intention to use robot technology.

Hypothesis 2: Robot commercialization beliefs will affect the intention to use robot technology.

There are various types of commercialized robots. Basically, robots can be classified into various types depending on the purpose of use. Additionally, the impact on intention to use may vary depending on the characteristics of the robot. This study aims to verify the influence on the intention to use robots by dividing them into elderly care robots, baby care robots, disabled care robots, school education robots, and construction site work robots according to user classification, focusing on the function of the robot. Under the assumption that the influence may vary depending on the type of robot, this study proposes the following detailed hypotheses without providing direction.

Hypothesis 2-1: Beliefs about the commercialization of elderly care robots will affect the intention to use robot technology.

Hypothesis 2-2: Beliefs about the commercialization of baby care robots will affect the intention to use robot technology.

Hypothesis 2-3: Beliefs about the commercialization of robots to care for the disabled will affect the intention to use robot technology.

Hypothesis 2-4: Beliefs about the commercialization of school education robots will affect the intention to use robot technology.

Hypothesis 2-5: Beliefs about the commercialization of construction robots will affect the intention to use robot technology.

Privacy beliefs

Privacy issues always arise when using digital media. Conceptual definitions of privacy vary. Methods for measuring privacy also vary depending on the characteristics of the study. The most commonly used concept is privacy concerns. Privacy concerns are also related to digital capabilities and have excellent explanatory power for digital media use (Ryu, 2024). The concept of privacy involvement is also used. In research on artificial intelligence technology, it is said that privacy involvement affects pleasure, which is an emotional response to artificial intelligence technology (Jun & Lee, 2023). Privacy involvement also directly affects behaviors such as advertising avoidance (Jun, 2022). This study seeks to investigate beliefs about privacy.

Given that beliefs influence behavioral intentions, beliefs about privacy can also influence behavioral intentions. In a study on personal information protection in social network services (SNS) using the health belief model, it appears that the perception of the severity of privacy affects privacy protection (Shin, Kim, & Kwon, 2016). College students' awareness of privacy protection in their use of SNS has a positive effect on their privacy protection behavioral intention (Kim, & Park, 2013). These research results show that various belief factors about privacy are involved in the perception of privacy and affect behavioral intentions. Therefore, this study will investigate the role that beliefs about future privacy play in the intention to use robot technology.

Hypothesis 3: Future privacy protection beliefs will affect the intention to use robot technology.

Perception of privacy generally has a negative impact on attitudes and behavioral intentions. A representative example is concerns about privacy. Empirically, privacy concerns about data marketing services have been shown to have a negative impact on acceptance intention (Kim, 2022). However, in the case of privacy involvement, conflicting results are shown. In existing research, privacy involvement appears to have a positive effect on pleasure, one of the emotions toward artificial intelligence technology (Jun & Lee, 2023). However, privacy involvement is said to have a negative impact on personalized advertising attitudes and increase advertising avoidance (Jun, 2022). Moreover, studies on online shopping malls show that perceived information privacy concerns do not have a direct effect on purchase intention (Yang, & Hyun, 2020). These results show that the impact of perception of privacy on behavioral intention is inconsistent. This may vary depending on the target and the measurement of privacy. The beliefs about privacy covered in this study may also have various conceptual definitions. This study will focus on beliefs about future privacy. Specifically, this study would like to investigate the individual influences by dividing them into the belief that privacy exposure will expand in the future, the belief that personal information can be actively managed according to digital literacy, and the belief that privacy protection will also be polarized in the future. Therefore, a detailed hypothesis group for Hypothesis 3 is proposed.

Hypothesis 3-1: Beliefs in expanding privacy exposure will affect the intention to use robot technology.

Hypothesis 3-2: Digital literacy beliefs will affect the intention to use robot technology.

Hypothesis 3-3: Privacy protection polarization beliefs will affect the intention to use robot technology.

METHODOLOGY

Samples

This study verifies the proposed research model using secondary data previously collected for public purposes. The data used in this study is the 2022 Intelligent Information Society User Panel Survey data from Korea. The data was collected from people over 15 years of age and under 69 years of age who were smartphone users and used the Internet more than once a day. The survey method for the sample was 1:1 household interview method. The survey was conducted for approximately 100 days between October 5, 2022 and January 13, 2023. Ultimately, a sample of 5,378 people was collected from six major metropolitan areas in Korea. Among the respondents, 2,752 (51.2%) were men and 2,626 (48.8) were women. The age range was 306 people in their teens (5.7%), 926 people in their 20s (17.2%), 939 people in their 30s (17.5%), 1,106 people in their 40s (20.6%), 1,168 people in their 50s (21.7%), and 933 people in their 60s (17.4%). The educational background of the

survey participants was 2,175 (40.4%) with a high school diploma or less, and 3,203 (59.6%) with a college degree or higher.

Measurements

Robot usefulness beliefs were measured for robots (cleaning, nursing, and serving) using the question, “How much do you think the following technologies can improve your life?” (M=3.42, S.D.=.68). A 4-point Likert scale was used to determine robot usefulness beliefs.

Robot commercialization beliefs were measured using the question “How long do you expect it will take for the following services to be commercialized?” using the following questions: 1) robots care for the elderly in nursing homes (household care work: elderly people) (M=3.99, S.D.=1.24), 2) robots care for and take care of babies (housework care work: babies) (M=4.19, S.D.=1.25), 3) robots care for and take care of disabled people (household care work: disabled people) (M=4.17, S.D.=1.28), 4) robots replace school education (high level service: education) (M=4.14, S.D.=1.27), and 5) robots take over dangerous work at construction sites (simple labor) (M=3.72, S.D.=1.45). Beliefs about robot commercialization were measured using 6-point scale (① over 10 years, ② within 10 years, ③ within 7 years, ④ within 5 years, ⑤ within 3 years, ⑥ within 1 year).

Future privacy beliefs are measure by following sentences: ‘If artificial intelligence or the Internet of Things becomes widespread, privacy exposure will

increase (increased privacy exposure) ($M=3.70$, $S.D.=.70$), 'Individuals will be able to actively determine the level of personal information exposure using their ability to use intelligent information (digital competency) ($M=3.68$, $S.D.=.75$),' and 'The rich will receive more privacy protection, while the poor will have less privacy protection (privacy protection polarization) ($M=3.63$, $S.D.=.81$). Future privacy protection belief questions were measured on a 5-point Likert scale.

The dependent variable, intention to use technology was measured by the sentence, "Recently, new technologies have emerged and are changing our daily lives. Do you intend to use the robot technologies (cleaning, nursing care, serving robots, etc.)" ($M=3.37$, $S.D.=.77$). Intention to use technology was measured on a 4-point Likert scale.

RESULTS

Hypotheses Testing

Hierarchical regression analysis was conducted to verify the hypotheses proposed in this study. Hierarchical regression analysis was regarded to be the most appropriate analysis method to understand the individual effects of the belief variable group and the collective effect with other variables as a whole. The variables for belief were usefulness, commercialization, and privacy, as suggested in the hypothesis, and were input as independent variables in that order.

Demographic variables gender and age were used as control variables. First, a regression analysis was conducted by inputting demographic variables. As a result of

the analysis, gender was found to be not statistically significant ($p > .05$). Age was statistically significant, and the younger the age group, the higher the intention to use robot technology ($\beta = -.209$, $p < .001$). The usefulness belief proposed in Hypothesis 1 was statistically significant and appeared to have a positive effect on the intention to use robot technology ($\beta = .366$, $p < .001$). Therefore, hypothesis 1 was supported.

Next, in the case of beliefs about robot commercialization proposed in Hypothesis 2, the effect of beliefs about commercialization of elderly care robots on intention to accept robots was found to be not statistically significant ($p > .05$). The remaining four variables were statistically significant. However, the direction of individual belief variables showed differences. Specifically, beliefs about the commercialization of baby care robots ($p < .01$) and disabled care robots ($p < .05$) were found to have a negative impact on the intention to use robot technology. On the other hand, student education robots ($p < .001$) and construction site work robots ($p < .01$) were found to have a positive effect on the intention to use robot technology.

As a result, Hypothesis 1-1, which proposed the role of belief in the commercialization of elderly care robots, was rejected and the remaining hypotheses were partially supported. Lastly, in the case of future privacy protection beliefs, the privacy variable proposed in Hypothesis 3, beliefs about future privacy exposure expansion were found to have a positive effect on the intention to use robot technology ($\beta = .068$, $p < .001$). Therefore, Hypothesis 3-1 was supported, and Hypothesis 3-2 and Hypothesis 3-3 were rejected.

Table 1: Results of regression analysis

IV		Model 1	Model 2	Model 3	Model 4
Demo	Gender	-.005	-.006	-.005	-.005
	Age	-.209***	-.164***	-.149***	-.146***
Usefulness beliefs			.366***	.357***	.346***
Feasibility beliefs	elderly care robot			.001	.005
	baby care robot			-.079**	-.073**
	disables care robot			-.074*	-.071*
	school education robot			.158***	.170***
	work robot			.055**	.042*
Future privacy beliefs	privacy exposure				.068***
	digital literacy				.006
	privacy polarization				-.010
adjusted R ² =(ΔR^2)		.043	.175(.132***)	.191(.017***)	.195(.004***)
F		117.242***	366.675***	153.463***	114.433***
* $p < .01$, ** $p < .001$					

DISCUSSIONS AND CONCLUSION

This study verified the antecedent factors that influence the intention to use robot technology by modeling them around the concept of belief. As a result of analysis through secondary data, usefulness beliefs were found to have a positive effect on intention to use robot technology (Hypothesis 1). Among the variables included in robot commercialization beliefs, beliefs about the commercialization of baby care robots and disabled care robots were found to have a negative impact on the intention to use robot technology (Hypothesis 2-2, Hypothesis 2-3). However, student education robots and construction site work robots were found to have a

positive effect on the intention to use robot technology (Hypothesis 2-4, Hypothesis 2-5). Among the variables included in future privacy protection beliefs, which are privacy variables, beliefs about increased future privacy exposure were found to have a positive effect on the intention to use robot technology (Hypothesis 3-1).

The results of this study provide academic implications. In a reality where robots are being commercialized along with the development of artificial intelligence technology, the preceding factors that influence recipients' intention to use robots were investigated. In particular, the fact that large-scale survey data was used to test the hypotheses also adds to the meaning of the paper. Research on technology acceptance shows that the acceptance method varies greatly depending on the target technology. Specialized technology services, such as robots, may differ from general digital technology products. To overcome these limitations, this study used large-scale recipient data to analyze antecedent factors that affect acceptance intention. It is believed that it will be helpful in generalizing the research model proposed in this study in that the sample can ensure representativeness.

In establishing the research model, factors affecting technology acceptance were categorized based on the concept of belief. An academic implication is that hypothesized relationships were proposed and verified focusing on the relationship between the factors that make up beliefs and behavioral intentions. Belief is an important concept that influences attitudes and behavior and plays a useful role in explaining the antecedents of technology acceptance. In this study, the concept of usefulness, which is mainly used in the technology acceptance model, was first

reconceptualized and used as usefulness belief, and its influence was verified. Perceived usefulness, along with ease of use, functions as a mediating variable repeatedly used in technology acceptance models (Davis, 1989; Kim, 2022). This study also confirmed the positive impact of perceived usefulness of robots on intention to accept robot technology. The role of the concept of usefulness as a belief can be said to increase the applicability of usefulness as a belief beyond simply the perceived usefulness of the technology itself used in the technology acceptance model.

The belief that robot technology will be commercialized in the near future was also found to be factors influencing behavioral intention. In this study, commercialization beliefs were used as a concept meaning perceived behavioral control in the theory of planned behavior and showed the same results as the existing theory (Ajzen, 1991). However, as a result of examining the influence of beliefs about commercialization in detail in this study, it can be seen that the influence of beliefs about commercialization on intention to accept varies depending on the type of robot. People who believed that commercialization of robots to care for babies or the disabled were not far away had lower intentions to use robot technology. On the other hand, belief in the commercialization of robots for school education or work at construction sites was found to increase intention to use them. This can be understood as a difference in acceptance depending on the type of robot. Robots that replace education or construction work have the function of replacing routine tasks. This can be understood as a high possibility and high acceptance intention from the

perspective of general recipients. However, in the case of robots with special market segments, such as children or the disabled, the belief in commercialization is different from that of everyday robots, and the acceptance intention of the general public is also negative. Services in which a segmented market exists provide utility only to those who need the service. Therefore, it shows that expectations for commercialization of the technology itself as well as acceptance intentions of special interests need to be understood separately from general consumers.

Lastly, among beliefs about future privacy protection, people who believed that privacy exposure would expand in the future showed a high intention to use robot technology. Privacy beliefs in this study are a different concept from privacy concerns that have been widely used in existing research. It was not a positive or negative evaluation of privacy exposure, but a future belief about privacy, which was found to have a positive effect on intention to use. When concerns about privacy are high, the intention to accept technology is generally low or negative (Kim, 2022). However, it shows that having already formed beliefs about future privacy protection can have a positive effect on the intention to accept the technology.

This study also provides practical implications. In order for robots to be introduced and distributed in daily life, an understanding of users' beliefs must be preceded. As argued in attitudinal psychology, positively constructed beliefs have a direct impact on attitudes and behavior. Therefore, for businesses that industrially produce and distribute robots, an in-depth understanding of consumers' beliefs must come first. Based on understanding consumers, it will be possible to establish

strategies for commercialization and marketing communications. In the case of new technological services such as robots, it is necessary to instill correct and firm beliefs in users about robot services in order to form positive attitudes and increase acceptance intention.

First and foremost, it is needed to instill the belief that robot services are useful. Robots used in daily life have both positive and negative aspects from the user's perspective. When robots interact with humans in the workplace, it may be convenient because there is no need to meet employees face-to-face, but direct communication with humans may be limited, which may cause problems with the service you want to receive. Even with a robot equipped with artificial intelligence, it is impossible to provide human-like services at the current level of commercialization. Although the efficiency of communication with robots varies depending on the characteristics of the user, there is always a possibility of problems. Therefore, it will be important to introduce robots that can provide complete services, but fundamentally, strong communication about the advantages and utility of new technological services will be necessary.

Effective communication is needed about beliefs about commercializing the technology. Even people who think robots are useful cannot expect a positive evaluation of the service if they do not think robot services are feasible. This has been explained through the concept of behavioral control, and there is a need to make people feel visibly in control of the services they use. It is not possible to think deeply about the acceptance of the service without knowing when the service will be

released. If expanding the discussion on behavioral control a little further, there may be anxiety that commercialized robots may be harmful to humans. Assuming that the robot service malfunctions or falls outside the scope of human control, this could be a fatal factor in using the service. Recently, due to electric vehicle battery fires, we can see that the purchase intention of electric vehicles is decreasing and it is also affecting the investment strategies of automobile companies. Therefore, it will be necessary to operate the service and provide practical information to large consumers so that they can recognize human control over robot services.

In order to increase acceptance of robots and achieve long-term commercialization, objective information on future privacy must be provided. Most users of digital services have concerns about privacy. Vague concerns usually have a negative impact on attitudes and acceptance of a product or service. However, it is necessary to inform users that even if privacy exposure is expanded in the long term through the provision of objective information, utility will be created in return for this. In the case of personal information, people have to worry about the benefits and costs of providing personal information themselves and then make a judgment about it. Therefore, if the benefits of privacy are recognized through the provision of accurate information, the acceptance of technology may not be influenced simply because personal information exposure increases. This is a problem that must be overcome through communication efforts by product/service providers, and institutional support for privacy must also be provided.

This study inevitably has limitations in that it uses secondary data. Unlike primary data, the data used in this study was not elaborately specified for academic purposes, so caution is required when interpreting the research results. This needs to be supplemented through primary data research that collects direct survey data targeting the variables included in this research model, and this is proposed as a follow-up study. Another thing is that if research is conducted on the use and acceptance of various intelligent devices or services other than robots focusing on the user belief variables in the research model proposed in this study, it will be helpful not only in generalizing the results of this study but also in expanding the research model.

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