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Searching for New Technology Acceptance Model under Social Context: Analyzing the Determinants of Acceptance of Intelligent Information Technology in Digital Transformation and Implications for the Requisites of Digital Sustainability

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Abstract: Intelligent information technology (IIT) based on AI and intelligent network communication technology is rapidly changing the social structure and the personal lives. However, IIT acceptancefrom various perspectives still requires extensive research. The research question in this paper examines how five factors—psychological, technological, resource, risk perception, and value factors—influence IIT acceptance. Based on an analysis of survey data, it was first found that the acceptance rate of IIT itself was generally very high. Second, in terms of IIT acceptance, among twenty-five predictors, voluntariness (+), positive image of technology (+), performance expectancy (+), relative advantage (+), radical innovation (+), and experience of use (+) were found to have significant effects on the IIT acceptance. Third, in addition to technological factors, psychological factors and risk perception factors also played an important role in individuals' decisions regarding IIT acceptance.

Keywords: technology acceptance model (TAM); adoption of technology; digital transformation; intelligent information technology; risk perception; digital innovation

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1. Introduction

Intellectual information technology (IIT) affects the everyday lives of people. In the field of health sector, digital health based on IIT is fundamentally changing the social structure. IIT is an advanced form of existing information and communication technology that uses artificial intelligence and network technology. In the age of the fourth industrial revolution, IIT can provide automated, unmanned, real-time services and products to people. IIT under fourth industrial revolution is a byproduct of the third industrial revolution, and it is inextricably linked to the sense of technology convergence across various disciplines. It combines online Internet technology with artificial intelligence, big data, Internet of Things (IoT), and cloud technology. IIT has tremendous effects on the daily lives of people; It directly affects changes not only between time and space, but also between individuals, society, and the country [1]. The future of the fourth industrial revolution was seriously debated at the 2016 World Economic Forum (WEF). Klaus Schwab, the World Economic Forum's organizer and chairman, claimed that the Fourth Industrial Revolution would be identical to the First–Third Industrial Revolutions [1]. However, the fourth industrial revolution will fundamentally transform civil communities and manufacturing industries. In particular, most recent technological advancement has showed unprecedented societal

transformations as well as the interconnectedness and reciprocity of the digital technology revolution [2]. In a recent survey of citizens in South Korea, 47.3% of respondents indicated that AI had already come to be used in everyday life and that it would become widespread over the next five to ten years [3]. As global trends in emerging disruptive innovations and domestic circumstances are intertwined, there is resulting in extensive technology development [4]. Therefore, the use of IIT is expected to become increasingly common denominator for development in everyday life in the future. The adoption of this IIT is crucial to a country's economic competitiveness and growth. The growth of IIT can create plenty of new opportunities for new challenge in previously inaccessible fields. For example, biomedical engineers are now developing prosthetics with human-like sensory functionality. To response the new technology, every countries currently have plans to launch industry initiatives for emerging technologies and have launched intelligent technological strategies together with key players such as businesses, academics, and government counterparts.

However, this IIT could increase crisis awareness and a fear toward new technology, which could result in public's negative psychological response to technical advancements [5]. Using U.S. historical data, Rifkin [6] refers to the end of work that technological advances could bring out. A McKinsey report published in 2017 found that the fourth industrial revolution based on IIT will affect 25% of the global workforce, and more than half of companies believe that technical progress will reduce full-time staff jobs by 2022, and by 2030, robots are expected to replace 800 million workers [7]. Under the expected effects of the introduction of IIT, currently companies are facing pressure to increase their productivity by automating certain jobs or replacing them with IIT.

Research on the technology acceptance at the organization level as well as individual level is reissued due to COVID-19 outbreak. Because of the COVID-19 pandemic and social-distancing policies, remote working has increased. Remote workers use e-mail and social media applications to share work and have meetings. The COVID-19 crisis is forcing workers to abruptly adapt to the digital world and remote work. Prior to COVID-19, the unit of analysis on technology acceptance was the organization. However, after COVID-19 outbreak, the unit of analysis has been shifted towards the individual rather than the organization. Since the unit of analysis is the individual, various individual psychological factors should be considered as crucial variables in the acceptance of IIT.

In public health sectors, with the growing technological innovation, personalized healthcare service and precision medicine have begun to be enthusiastically researched [8]. Recent developments in IIT have allowed us to enhance wide-scale biologic databases, launch effective methods for characterizing patients, and create analytical techniques for processing diagnosis and collecting evidence in real time [9]. In particular, increases in mobile connectivity and the popularity of wearable devices such as health IoT devices have opened new opportunities for public health professionals and workers [8].

As IIT devices and techniques can be used to recognize and understand physiological variability among individuals for diagnosis and care, they can make it easier to implement preventive and therapeutic measures. For example, Feng et al. [10] showed the use of mobile phones and short messaging services to monitor health-seeking activities and assess public facilities. Due to its unprecedented rapid expansion of IIT, the internet has widened the reach of the public health sector far beyond its conventional boundaries [8]. However, as seen in the COVID-19 pandemic, there is increased public awareness of unintentional prejudices in the collection and utilization of individual data, along with suspicion [11,12]. Therefore, regarding the technology acceptance in public health, it is necessary to be concerned with data interoperability, privacy, security, and ethics [8]. Also, it is important to recognize and understand individual factors which increase the acceptance of IIT. Without obtaining support from every individual, data access and analysis for advanced health service will be difficult and uptake will be extremely slow [13]. Wnuk et al. [12] found that individual perceived threat, lack of control, and individual ideology also affected the acceptance of a tracking app for COVID-19.

In addition, research about IIT is continuously conducted with technological advancements, it is still unclear whether they may be beneficial or harmful for society. There are still many debates on the usefulness of IIT. Sensitive issues such as privacy and security are still important in the use of private individual information in public health [14]. Therefore, although there is increasing research on technology products that use IIT, humane variables such as the accessibility and ease of use need more attention for empirical research [15]. Furthermore, rather than using individual variables, many studies have used variables in organizational contexts [16]; this has led to questions about the reliability and generalization of previous findings under social contexts.

In this respect, we examine the preceding factors that affect the individual acceptance of IIT. We suppose five main factors that affect IIT (psychological, technological, resource, risk perception, and value factors) and explore which of these factors causally explain the practical acceptance of IIT. We believe our findings can contribute to the extant literature in the field and help elucidate the individual features of IIT. Continued research on IIT acceptance will provide important implications for building new digital healthcare systems.

2. Theoretical Materials and Methods

2.1. Technology Acceptance Model and Its Limitations

Research into technology acceptance began as technology has been used everywhere in attempts to improve organizational performance. Most theories of technology acceptance have intended to find out which factors determine an individual's level of acceptance and engagement with a technology or information system. With much discussions about which considerations should be made to successfully implement technology in organizational settings, usually technology acceptance models have been proposed at organizational-level. For example, Davis's Technology Acceptance Model (TAM, hereafter) was proposed to explain technology acceptance principle at the organization level [17]. TAM is a basic and explanatory model that has been widely used until recently. The main variables used in TAM are perceived usefulness and perceived ease of use, which are linked to the attitude of use and the intention of use behavior, respectively. However, since TAM was criticized for focusing solely on the user's perceptual and utilitarian judgment toward information technology, Venkatesh and Davis [18] included subjective norms, image, and job relevance. They presented an Extended Technology Acceptance Model 2 (TAM2, hereafter), wherein which external variables such as output quality and result demonstrability were included, and experience and voluntariness were added as well.

Although a lot of research on technology acceptance has mostly used TAM(2), they have limits to disregard the other important variables. Therefore, after Venkatesh et al. [19] conducted an empirical examination of the variables that had been used in several TAM studies, they suggested Unified Theory of Acceptance and Use of Technology (UTAUT, hereafter) by adding new explanatory variables. UTAUT, which is composed of new explanatory variables, has 70% explanatory power. The new variables used in UTAUT were performance expectancy, effort expectancy, social influence, and facilitating conditions. In this model, the relationships among these new variables, behavioral intention and use behavior was controlled by gender, relationship, experience, and voluntary use.

Since information technology and its application not only exists in organizations but is widely used in society, it needs a theoretical model that can explain acceptability from the point of view of not only members of the organization but also the general public. This suggests that a technology acceptance model is needed at the individual level in social context, not the organizational level in organizational life. As a result, Venkatesh et al. [20] suggested Unified Theory of Acceptance and Use of Technology 2 (UTAUT2, hereafter). In this model, hedonic motivation, price value, and habit variables are applied to independent variables and used as control variables.

Table 1 lists summarize the main variables examined in research on technology acceptance.

Table 1. Representative models in technology acceptance research.

Theory	Author(s)
Theory of Reasoned Action: TRA	Fishbein and Ajzen [21]
Innovation Diffusion Theory: IDT	Rogers [22]
Technology Acceptance Model: TAM	Davis [17]
Social Cognitive Theory: SCT	Bandura [23]
Model of PC Utilization: MPCU	Thompson et al. [24]
Theory of Planned Behavior: TPB	Ajzen [25]
Motivation Model: MM	Davis et al. [26]
Decomposed Theory of Planned Behavior: DTPB	Taylor and Todd [27]
Combined TAM and TPB: C-TAM-TPB	Taylor and Todd [27]
Extended Technology Acceptance Model: TAM2	Venkatesh and Davis [18]
Unified Theory of Acceptance and Use of Technology: UTAUT	Venkatesh et al. [19]
Unified Theory of Acceptance and Use of Technology 2: UTAUT2	Venkatesh et al. [20]

We adopted five factors—technological, psychological, risk perception, resource, and value factors. Previous studies have mainly focused on two of them, technological and psychological factors. For example, Davis [17] payed attention to two factors: perceived usefulness and perceived ease of use. Since those two variables are key byproducts of user's subjective psychological judgment, Davis [17] overlooked more objective factors such as resources. Venkatesh et al. [19] suggested UTAUT and paid attention to the variables of expectation and experience. Venkatesh et al. [20] added motivation and price value variables to independent variables. These variables are similar to those of Davis in that they focus on cognitive and perceptual aspects of users. However, those studies overlook more 'fundamental', objective' and 'risky' factors. Therefore, this study focus on 'fundamental' value, 'objective' resource, and 'risk' perception, and value factors as well as the psychological and technological factors.

First, we focus on more fundamental value factors than cognition or perception in psychological factors. The value has overlooked in previous studies, although value as fundamental human orientation plays a decisive role in judgements toward technology. Baazeem [28] argued that since users' behavior is shaped by their religious beliefs, religiosity can influence their judgments in relation to technology issues, such as privacy issues. Chao and Yu [29] demonstrated that value such as technology optimism acts as a moderator between perceived behavioral control, attitudes, and social influences and behavioral intentions related to weblog learning. Moreover, Belanche et al. [30] reported that two personal values (citizens' time consciousness and environmental concern) contribute to individuals' adoption of information technology. Also, Youn and Lee [31] proposed and empirically tested a value-based technology acceptance model. They showed that three values—social value, emotional value, and functional value—are associated with perceived ease of use or perceived usefulness, which have impacts on behavioral intentions towards the use of mobile media services.

Second, we focus on objective resource factors as well as subjective psychological factors. Studies related to the information gap have been studying the problem of information accessibility according to the amount of economic and social resources for a long time. For example, Martin and Robinson [32] showed that the odds of access to internet increased most rapidly for individuals at the highest family income levels and most slowly for individuals at the lowest income levels. Moreover, Abu-Shanab [33] found that education significantly indirectly affects relationships between performance expectancy, self-efficacy, perceived trust, and locus of control and the behavioral intention to use Internet banking. Also, Youn and Lee [31] demonstrated that consumer's positive or negative experiential factors have significant impacts on belief and acceptance toward specific technology.

Third, we pay attention to risk perception factors because the traditional TAM approaches technology from the perspective of internal organization technology. The risk perception research approaches technology from the perspective of risk communication

at the social level. For example, based on an empirical study of 161 subjects, Im et al. [34] demonstrated that in addition to technology type and gender, perceived risk was also a significant variable in influencing users' adoption of technology. Also, Lee [31] specified the role of perceived risk in technology acceptance; The intention to use online banking is adversely affected mainly by the security/privacy risk, as well as financial risk, and is positively affected mainly by perceived benefit, attitude, and perceived usefulness. Similarly, Youn and Lee [35] highlighted that perceived risks, such as price risks and technological barriers, critically influence technology acceptance. Also, Belanche et al. [30] reported that in addition to the perceived ease of use and perceived usefulness, trust also critically influences the adoption of e-government services.

2.2. Psychological Factors

2.2.1. Personal Innovative Behavior

Rogers [22] introduced the innovation diffusion theory (IDT, hereafter), and it is not an overstatement to conclude that most studies on innovation begin with this theory. The IDT is a theory that explores how innovations spread through the mechanism of consumer acceptance. Rogers [22] described innovative behavior as the rapid adoption of relatively new ideas. Subsequent empirical research has established that personal innovativeness affects the implementation and acceptance of emerging technologies [27,36,37]. Since IIT has a very high degree of innovation, previous studies are actively being conducted on the role of personal innovativeness and the acceptance of IIT. Slade et al. [38] found that innovation had a positive effect on remote support mobile payments. Another study showed that personal innovativeness had a positive effect on the acceptance of smart devices equipped with AI [39]. Therefore, based on the above discussion, the following hypothesis is proposed.

Hypothesis 1 (H1). *Personal innovative behavior is positively related to intelligent technology acceptance.*

2.2.2. Intrinsic Motivation

Previous motivational theories largely conceptualize motivation as either extrinsic or inherent. Davis et al. [26], who introduced a motivation model in the context of technology acceptance studies, considered motivation variables. Motivation was generally subcategorized into external and internal motivation; extrinsic motivation is characterized as the benefit of technology use, whereas intrinsic motivation is defined as the personal satisfaction associated with technology use. Davis et al. [26] showed that both external and internal motives had a positive effect on technology acceptance, but that external motivations had a significantly larger impact.

Recent studies have shown that the individual use of IIT is more positively influenced by intrinsic motivations such as pleasure and satisfaction. In a study by Park [40], external motivation was not significant for IIT acceptance, whereas intrinsic motivation was significant.

Hypothesis 2 (H2). *Internal motivation for IIT is positively related to IIT acceptance.*

2.2.3. Self-Efficacy

Self-efficacy refers to one's confidence in their ability to complete a task [23]. In terms of technology acceptance, self-efficacy is studied as a variable associated with innovativeness in Rogers's [23] IDT. It has been found that the higher one's self-efficacy, the easier and more positive is one's acceptance of information technology, and the higher their individual satisfaction [40]. Self-efficacy has been verified as an significant variable that affects the preceding variables of TAM by Davis et al. [36,41,42]. Indeed, Agarwal and Karahanna [43] found that self-efficacy has an impact on ease of use. Also, Venkatesh and Davis [44] found that it has a positive effect on perceived ease of use. Since self-efficacy is expected to have a

significant factor in human behavior [45], it has impact on technology acceptance by easily evoking interest in using information technology and affecting the behavior selection and consistency [46]. As a result, it was concluded that self-efficacy had a direct positive impact on acceptance in this study, and the following hypothesis was developed.

Hypothesis 3 (H3). *Self-efficacy is positively related to IIT acceptance.*

2.2.4. Voluntariness of Use

Voluntariness of use refers to the voluntary use of technology, as suggested in Venkatesh et al. [19]'s UTAUT. In UTAUT model, the role of voluntary use was included as a variable to control the interaction between social impacts on technology use and behavioral purposes. Later, Venkatesh and Davis [18] expanded TAM by using voluntariness as a component that influences the interaction between subjective norms and purposes of use. Moore and Benbast [47] categorized voluntariness into two categories: environmental and consumer aspects. The environmental perspective describes how the voluntariness with which technology is accepted is attributed to external environmental influences. In this case, voluntariness is unrelated to personal bias and perspective. Meanwhile, voluntariness of use on the consumer's side is a result of cognitive-based voluntary motivation, or an individual's internal intent, which is often explained as a term analogous to intrinsic motivation [45,48].

The voluntariness of use referred to in the integrated technology acceptance model can correspond to users' voluntariness. Although cognitions are influenced by the direct external effects of technology use, individual dimensions of voluntariness and experience serve as moderating variables in the integrated technology acceptance model [48–51]. In this study, voluntariness is used as an independent variable that directly affects technology acceptance. If voluntariness of use could be explained with intrinsic motivation, it would have a significant effect on technological adoption. Therefore, based on the above discussion, the following hypothesis was proposed.

Hypothesis 4 (H4). *Voluntariness of use is positively related to IIT acceptance.*

2.2.5. Performance Expectancy

Performance expectancy was suggested by Venkatesh et al. [19] as a concept within UTAUT. It was defined as the belief that the use of technology will improve workplace performance. Since the original TAM was proposed as a model for the acceptance of new technology in organizational settings, performance expectancy was often used as a variable to describe the intention to accept technology at the organizational level. However, since technology is not used solely in organizational settings, this variable has been often used to explain the individual adoption of technology. Venkatesh et al. [20] suggested TAM 2 to explain the use of technology at the individual level.

Even in the acceptance of IIT, performance expectancy has been studied as a variable that has a positive effect. For example, performance expectancy in the use of mobile application has been shown to positively affect technology acceptance [52,53]. It has also been shown to have positive effects on the acceptance of remote-assisted mobile payment systems [24] as well as the use of services equipped with artificial intelligence [39,54,55]. Based on this discussion, we proposed the following hypothesis.

Hypothesis 5 (H5). *Perceived performance expectancy is positively related to IIT acceptance.*

2.3. Technological Factors

2.3.1. Perceived Usefulness and Perceived Ease of Use

Perceived usefulness and perceived ease of use are the most important variables in research related to technology acceptance. These two variables were suggested in TAM by Davis [15] as well as in UTAUT by Venkatesh et al. [19].

Perceived usefulness and perceived ease of use are often investigated together. The definition of each variable is as follows. Perceived usefulness is the improvement of expected performance through the use of technology, where technology can be expected to improve performance at both the organizational and individual levels; meanwhile, perceived ease of use is the level of expectation that the technology can be used without great effort from the user [15].

Many studies have been conducted with these two variables to explain the technology acceptance. Lee and Shin [56] stated that when mothers with infants and toddlers perceive the usefulness and ease of robot-based education, their intention to accept such education increases. Kim et al. [55] demonstrated that the perceived usefulness and ease of use had a positive effect on the use of artificial intelligence speakers. In a study by Moslehpour et al. [57], higher levels of perceived usefulness and ease of use led to greater acceptance of an Internet payment method. In a study by Kim et al. [58] examining the acceptance of information technology by a professional internal auditor, perceived usefulness and convenience of use were found to affect the acceptance of it. Perceived usefulness is related to basic information technology acceptance. In contrast, perceived ease of use is more related to the acceptance of advanced functions.

Hypothesis 6 (H6). *Perceived usefulness is positively related to IIT acceptance.*

Hypothesis 7 (H7). *Perceived ease of use is positively related to IIT acceptance.*

2.3.2. Relative Advantage and Complexity

Relative advantage is defined as the degree to which innovative technologies are perceived as better than existing technologies. Relative advantages were presented in Rogers's [36] IDT. The IDT attempts to identify the factors that affect the rate of innovation diffusion and the process of innovation acceptance by members of society. Based on IDT, Moore and Benbasat [47] discussed that relative advantage, compatibility, ease of use, visibility, image, result demonstrability, and voluntarism were relevant in the acceptance of an information system (IS). Since then, Rogers [22] presented the perceived characteristics of relative advantage and complexity as well as compatibility and trialability as factors influencing the adoption of innovation. Among these, relative advantage has been confirmed by several empirical studies to have a positive effect on the acceptance of innovation, and its explanatory power has also been proven. Venkatesh et al. [19] included relative advantage in the integrated technology acceptance model. Scott et al. [59] demonstrated the critical role of relative advantage and its observability in innovation processes.

Complexity is defined as the degree to which it is viewed as difficult to understand and use technology. It has been used as a factor in UTAUT by Venkatesh et al. [19]. Moreover, it is associated with humane side of technology. The PC application model is a theory derived from Triandis [60]'s theory of human behavior in the information system (IS). According to the theory of human behavior, beliefs cause humans to act and are influenced by social factors. The social factor affects beliefs in human external contexts, and in an information system context, complexity is a factor that affects the use of information systems. The complexity can be regarded as a social factor in human behavior theory. Complexity is empirically tested as key variables in explaining the innovation acceptance by Moore and Benbasat [47] and Rogers [22], as well as by Thompson et al. [18].

Hypothesis 8 (H8). *Perceived relative advantage is positively related to IIT acceptance.*

Hypothesis 9 (H9). *Perceived complexity is negatively related to IIT acceptance.*

2.3.3. Radical Innovation

Technology is classified into radical and incremental innovations according to the impact or degree of innovation [61,62]. Radical innovation consists of innovations at the

level of the emergence of a new technology that is different from the existing technology or technological system. It is an innovative technology that is claimed by Shumpeter [63] to lead to the "creative destruction" of the economy.

Accordingly, radical innovation tends to be created from R&D activities at the organizational level. As the development cost is significant when the market has no capacity, acceptance into the market has a high risk. Progressive innovation refers to improved or supplemented technologies, as opposed to fundamental changes to existing technologies. Although there is no sudden ripple effect that causes the original destruction, when incremental innovation is accumulated, the result is substantial.

IIT is discussed as a kind of disruptive technology. Disruptive technology is technology that is at the level of changing or reorganizing large aspects of human life, such as technology usage and markets. Some researchers have stated that IIT is a technology that represents an improvement over previous 3rd-industrial-revolution technology, but changes in the economic and industrial structure, such as the emergence of large platform companies, the sharing economy, the provision of personalized information based on data, and the personal lives of individuals, have been beyond expectations. It is clear that the emergence of IIT has had a different influence more than the emergence of previous technologies. Therefore, this study assumes that if IIT is recognized as a radical innovation, then fear of acceptance can be expected, which will negatively affect the intention to accept.

Hypothesis 10 (H10). *Individual perception of IIT as radical innovation is negatively related to its acceptance.*

2.4. Resource-Based Factors

2.4.1. Price Value

Price value is a variable suggested UTAUT2 by Venkatesh et al. [20], and it is defined as the extent to which it feels more valuable to use the technology relative to the cost of using it. As mentioned above, UTAUT2 is a model proposed to explain the technology acceptance of common consumers, and the price value is a variable that has been identified as making the most substantial difference between the organizational and common customer environments; this is because there is no cost in using the technology in an organizational context, whereas common consumers most often must pay to use the technology [20]. Since IIT-applied products are innovative and more advanced than previous products, the cost can be felt as a burden to individual consumers. Nevertheless, if it is worth paying for a product with IIT applied, it can be expected to have a positive effect on the IIT's acceptance.

Empirical research has shown that the importance of price is positive for mobile app acceptance [52]. The price value is used for explaining the mobile easy money transfers in Kong and Choi's [64] analysis. The results showed that the price value had a substantial impact on the use intention. Therefore, based on the above discussion, the following hypothesis is proposed.

Hypothesis 11 (H11). *Increased user perception of the price value of IIT is positively related to its acceptance.*

2.4.2. Income and Educational Level

Technology acceptance research began with TAM proposed by Davis et al. [36], which was theoretically elaborated and applied whenever a new technology appeared. Various scholars have proposed new technology acceptance models based on TAM. For example, Schepers and Wetzels [65] conducted research on technology acceptance by considering the following variables as factors that affect technology acceptance: Individual-related factors and technology-related factors. As IIT, such as devices and services, is increasingly likely to be used by individuals, it is increasingly necessary to investigate personal attributes to influence the use of IIT. Income and education level may be the predominant personal characteristics associated with the implementation of IIT, since they are main factors that

influence the social divides of uses of information technology. When advanced technology has a higher barrier to entry for adoption, and higher-income people have easier access to it. Based on this discussion, we propose the following hypothesis.

Hypothesis 12 (H12). *Individual income is positively related to IIT acceptance.*

Hypothesis 13 (H13). *Individual educational level is positively related to IIT acceptance.*

2.4.3. Experience of Use

Experience is defined as an interactive response to an existing object's stimulus [66]. Garrett [67] discussed experience as not simply a dimension of driving and using a product, but as a contact between an individual and a product. Roto [68] stated that it is connected to an entity through interaction and feedback. The experience of a product to which new technology is applied can increase the awareness of technology or ease of technology, as well as familiarity [69]. It is necessary to utilize variables that consider not only instrumental aspects but also individual characteristics. In this respect, in explaining the technology acceptance, Venkatesh and Davis [18]'s TAM2, and Venkatesh et al. [19]'s UTAUT2 all utilized experience as a control variable. If IIT-enabled products increasingly permeate daily life, and as the number of people who have used such technology continues to increase, then familiarity with the technology will increase as well. Thus, anyone who experiences a product that utilizes IIT is increasingly likely to enhance their acceptance with IIT. Therefore, we proposed the following hypothesis.

Hypothesis 14 (H14). *Individual experience of IIT obtained by possessing IIT products is positively related to IIT acceptance.*

2.4.4. Facilitating Conditions

Facilitating conditions are defined as objective environmental factors that support the easy use of technology [19,24]. Triandis [60] discussed that human behavior is caused by habits, behavioral intentions, and facilitating conditions. Facilitating conditions are social factors; that is, external requirements outside of oneself. Thompson et al. [24] first attempted to introduce the conditions for promoting the theory of human behavior into the context of information systems, and they applied it to the model of PC utilization (MPCU) to explain PC utilization. As a result of including the facilitating condition as a significant variable in MPCU, Venkatesh et al. [19] used it as a variable in the integrated technology acceptance model (UTAUT), and it is still being studied as a representative variable of social factors in technology use. Individuals who are unfamiliar with new technology may find it difficult to use. However, if they have enough contextual support, they can easily accept the technology to use. Many empirical studies have examined the facilitating conditions that are positive for technology acceptance [38,39,52–55,70,71].

Hypothesis 15 (H15). *Facilitating conditions are positively related to IIT acceptance.*

2.5. Risk Perception Factors

Risk may cause a variety of feelings depending on who is aware of it [72]. Psychometric paradigm has suggested the critical role of perception factors at a subjective level [66]. It aims to elucidate how the perceived risks, benefits, trust, knowledge, and emotions affect individual's judgement and behavior.

2.5.1. Perceived Risk and Perceived Benefit

Risk may be conceptualized in two ways: a technical notion and a subjective notion. The former can be objectively grasped using a technical method, whereas the latter recognizes that there is social constructed risk. Subjective constructivism has suggested the concept of perceived risk, pointing out that it is difficult to objectively capture risk [73,74].

Perceived risk is evaluated subjectively based on the severity and vulnerability of the damage caused by the risk [64,65,67,75]. In the other hand, perceived benefit is defined as an individual's perception of effectiveness through material and non-material compensation for a risk object. In other words, it is the benefit that can be obtained from a risk response. Thus, perceived benefits increase risk response behavior [76]. The relationship between perceived risk and benefit is in an inverse relationship that plays an opposite role for risk [77–79], wherein decreasing one side increases the other [80,81]. IIT is predicted to be an innovative technology that can cause a collision between the old and the new, and it is part of a so-called "revolution". Previous research identified perceived risk as a variable that influenced the acceptance of innovative technology [59,82–86], and it was confirmed that perceived benefit was a variable that increased the intention to actively use information technology [52,87].

Hypothesis 16 (H16). *Perceived risk of IIT is negatively related to its acceptance.*

Hypothesis 17 (H17). *Perceived benefit of IIT is positively related to its acceptance.*

2.5.2. Image of Technology

In risk research, images as kinds of emotions and feelings become the influential factors in psychological risk studies [88–90]. Since images are correlated with emotions in decision making [89], emotions for particular subjects can be assessed by assigning a positive or negative value to the image [91]. Early studies on technology adoption excluded variables related to image or emotion; however, as research proceeded to the individual level, variables related to image or emotion began to be included. For example, in the TAM2, a component called "perceived satisfaction" was used as an emotional element [18]. Recent technology acceptance studies have suggested that feelings about technology have a positive effect on the intention to use products to which IIT is applied [92,93].

Hypothesis 18 (H18). *Perceived favorable image of IIT is positively related to its acceptance.*

2.5.3. Knowledge

According to Alba and Hutchinson [94], knowledge can be divided into familiarity and expertise; the difference between two concepts is whether or not it involves a task. Familiarity is the state of recognizing objects through knowledge [95], and it does not lead to tasks. By contrast, expertise knowledge is a step in which tasks are performed by using knowledge. This means that even if one is not at the level of professional knowledge, if that individual has knowledge about technology, then they will increase their familiarity with it. Lu et al. [96] stated that prior knowledge affected the use of mobile phones and wireless Internet. Lee and Shin [56] stated that expertise affects the adoption of smartphone-based mobile banking, and Chae [97] suggested that users' knowledge partially influences the continued acceptance of Internet banking. Based on the above discussion, the following hypothesis is proposed.

Hypothesis 19 (H19). *Knowledge is positively related to IIT acceptance.*

2.5.4. Trust in Government

The unknown risk posed by technology creates an 'assumed risk' for individuals. Because an 'assumed risk' has a greater impact than a well-known risk, it is considered riskier if relevant data are unavailable [98]. Regarding the public's perception of IIT, the barriers to technological awareness, as well as use, appear to be very high. Fear factors about the consequences of new technology on people's lives continue to emerge as a result of its spread. It is thus possible that ordinary people will experience anxiety when adjusting to technological trends. Anxiety about technology leads the public to rely on trust [99].

As a result, the government's role as a risk manager and public trust in the government are critical factors for the acceptance of technology policies. Trust is considered to be a factor that adjusts for technological uncertainty or complexity [100,101]. According to an empirical study by Park [102], trust in the government had a significant effect on the acceptance of the e-resident card policy. Kim et al. [103] suggested that trust has a positive effect on the risk acceptance of technology. Therefore, based on the above discussion, we assume that trust in the government has a positive impact on IIT.

Hypothesis 20 (H20). *Trust in government is positively related to IIT acceptance.*

2.6. Value-Based Factors

2.6.1. Science and Technology Optimism

Science and technology optimism is the value of having positive trust in science and technology, and it is the recognition that science and technology serve as solvers that can contribute to solving social problems. People who perceive science and technology optimistically rely on rationality [104], and they actively embrace technology by paying attention to the positiveness of technology [105]. IIT is expected to be used in various contexts, such as disaster situations, work places, and educational works. It is also used for data-based future prediction. Therefore, the more optimistic views ones hold about science and technology, the more positive they are about the adoption of IIT.

Hypothesis 21 (H21). *Perceived optimism in science and technology is positively related to IIT acceptance.*

2.6.2. Eco-Centrism

In environmental policy discourse, eco-centrism is the opposite of economic and technology centrism. If ecological centrism is the concept that environmental destruction must be taken into account during economic development, environmentalism emphasizes the interaction between ecosystems and humanity. Economic thinking was dominant during the industrialization period, but environmental concerns began to emerge in the late 1960s and early 1970s [106,107]. Based on these concerns, research on environmental issues began to be conducted in a variety of ways [108] and research on environmental issues was systematically established, ultimately constructing a concept contrary to technology-centrism in the 1980s [109]. Although technology-centrism and eco-centrism have been studied as opposite concepts, environmental economists have discussed how technology-centrism and eco-centrism can coexist through sustainable development. From an environmental economic standpoint, IIT has the potential to contribute to sustainable economic growth. However, generally IIT and eco-centrism were considered to have negative relationships between technology and environment because the technology provides main instrument to utilize the nature.

Hypothesis 22 (H22). *Perceived eco-centralism is negatively related to IIT acceptance.*

2.6.3. Anthropocentrism

The anthropocentrism that interprets the value as being experienced from the human point of view is a belief underlying the perception that humans are superior to all levels. Extreme anthropocentrism is often pointed out as the cause of environmental problems, and it involves the recognition that the indiscriminate development and use of environmental resources for human development is acceptable. Lee [105] points out that this kind of thought oriented in favor of technology emerged from human-centric thinking. Such human-centered thinking perceives humans as being superior in all areas, including the environment, where technology is actively used. Therefore, we proposed the following hypothesis.

Hypothesis 23 (H23). *Perceived anthropocentrism is positively related to IIT acceptance.*

2.6.4. Religiosity

Religiosity is based on the belief that God is superior to us and lives in an immaterial universe. Religion, according to Jung [110], is the unification between the greatest and strongest ideals and human beings. Human beings are thought to be and act as God's special creations. Thus, those with religious beliefs would acknowledge that entering religious areas in the advancement of human knowledge and technology is not appropriate.

However, since science and technology have permeated modern civilization, their entrance into religious spaces is regarded as being inevitable, and researchers have examined how religion and science can live harmoniously. Indeed, looking back at religious history, the humanities were questioned during the Renaissance and Enlightenment, whereas the natural sciences have been challenged since the second half of the twentieth century [111].

IT aims to realize abilities such as cognition, learning, and reasoning that only humans have yet been able to achieve. However, it is implied that the worldview of the established religious world could conflict with the worldview driving the science and technology revolution [111]. This movement implies that religion, science, and technology exist on the margins of each other, and hence the following hypothesis can be established.

Hypothesis 24 (H24). *Perceived religiosity is negatively related to IIT acceptance.*

2.6.5. Ideology

Ideology is a belief system in which value orientation and attitude are structured, and it causes people to consistently show support and policy preferences for political groups and candidates [112–114]. Support for science and technology in particular could vary depending on individual political ideologies [88]. Regarding the relationship between ideology and technological development, science and technology are thought to be important for gaining a competitive advantage from any ideological standpoint. Therefore, the acceptance of open and innovative science and technology policies is preferred for the advancement of science and technology. According to this ideological foundation, there is bipartisan support for the advancement of research and technology in terms of competitiveness [115]. From this point of view, the conceptual link between technology and ideology seems to be uncertain.

However, looking back at the history of science and technological development shows that science and technology are developed through collaborations between governments and corporations, or through industry-led advancements, with the intention of increasing global productivity and profitability [115]. This means that science and technology contributes to making the wealth for market, private companies and the rich, those who compose of the conservative group in given society. Therefore, from an ideological standpoint, it can be inferred that the more conservative a person is, the more their belief prevails in the development of industry enhancements, leading to corporate competitive advantages. Based on the above discussion, we proposed the following hypothesis.

Hypothesis 25 (H25). *Perceived conservative ideology is positively related to IIT acceptance.*

2.7. Research Design

2.7.1. Data

The data used in this study were collected from 8 July 2019 to 17 July 2019. The survey was administered through a web survey platform in which the population consisted of adults over the age of 19 in Korea. The sampling was based on a proportional quota based on region, gender, age, and experience of use. In total, 2000 people ultimately participated in the survey. The demographic characteristics are listed in Table 2. The results for the respondents' academic backgrounds were as follows: 34.8% of respondents had graduated from high school or above but had not graduated from a university, and

65.3% had completed university or above (undergraduate, college, and graduate). Monthly income, which was collected in an open format, was classified as less than 3.5 million KRW, between 3.5 and 5 million KRW, and more than 5 million KRW; each distribution was 35.6%, 32.2%, and 32.2%, respectively, with few differences. Regarding the ideological distribution of the sample, progressives accounted for 28.4%, moderates accounted for 52.8%, and conservatives accounted for 18.7%.

Table 2. Social and economic control variable summary statistics.

Variable		N	%	Variable		N	%
Sex	Male	967	48.4	Education	Below Univ. Graduate	695	34.8
	Woman	1033	51.7		Above Univ. Graduate	1305	65.3
Age	20s	329	16	Income	Below 3.5 million won	711	35.6
	30s	363	18.2		Over 3.5~ Below 5 million won	646	32.3
	40s	456	22.8		Over 5 million won	643	32.2
	50s	506	25.3	Ideology	Progressive	569	28.4
	Over 60s	355	17.8		Moderate	1057	52.8
Experience	Yes	1000	50		Conservative	327	18.7
	No	1000	50				

2.7.2. Measurement and Reliability Analysis

The purpose of this study is to analyze whether the five factors of technological, psychological, perception, resources, and value factors influence the acceptance intention, which is a kind of expectation to be involved in the adoption of IIT. The dependent variable was composed of five measurement items asking about the intention to accept IIT. Prior to measuring acceptance, a description of IIT technology was presented as follows: IIT is the core technology of the 4th industrial revolution, and the existing information and communication-related technologies have been intelligently advanced. IIT as a next-generation technology includes not only artificial intelligence technology but also advanced network (Internet, data connection, etc.)-based technology. Examples include artificial intelligence speaker services (e.g., GiGA Genie, Kakao Mini, etc.) and artificial intelligence assistants (e.g., Apple's Siri and Samsung Electronics's Bixby) that have recently come into our daily lives. IIT is not only used in daily life, but also in industrial fields such as in factory automation and unmanned automation, as well as health care fields such as in automatic health check-ups.

The independent variables constructed in this study are described here. First, the technological factors are related to the attributions of IIT at the technological level. The technological factors are composed of usefulness, ease of use, technological complexity, radical innovation, and relative advantages. Second, the psychological factors are variables of the psychological dimension that people could feel in the process of accepting IIT. The psychological factors are composed of personal innovativeness, motivation, self-efficacy, voluntariness, and performance expectancy. Third, the perceptual factors are variables that are perceived cognitively when using IIT. The perceptual factors consist of perceived risk, perceived benefit, price value, image of technology, and trust in government. Fourth, the resource factors are the resources that people can mobilize for the use of IIT. The resource factors are composed of personal education level, income, technology possession, and facilitating conditions. Fifth, the factor of value is the individual's value, and it includes the variables that are constructed by judging that the individual's value and views will affect their IIT acceptance. The value factors consist of science-technology optimism, eco-centralism, anthropocentrism, religiosity, and ideology. The items were constructed based on the items used in previous research. The items were checked for their Cronbach's α value for internal consistency. Generally, measurements are considered to be reliable if they have Cronbach's α values of 0.6 or higher. For all variables used in this study, Cronbach's

α exceeded 0.7. Table 3 summarizes the reliability, mean, and standard deviation values of the variables used in this study.

Table 3. Measurement reliability, mean, and SD.

Factor	Variable	Question	Reliability	Mean	SD
Psychological factor	Personal innovativeness	-I have the ability to use IIT or products (or services) to which the technology is applied at the level that I want (can). -I can use IIT or products (or services) to which the technology is applied more easily than others.	0.849	3.538	0.801
	Intrinsic motivation	-I am curious and want to use a product (or service) to which IIT is applied. -I would be proud if I used a product (or service) applied with IIT.	0.800	3.709	0.827
	Self-efficacy	-I think I can use IIT more easily than other people. -I think I can accumulate knowledge about IIT within a relatively short time.	0.851	3.338	0.716
	Voluntariness of Use	-I am willing to actively use products (or services) applied with IIT. -If I have an opportunity, I will actively use products (or services) applied with IIT.	0.904	3.627	0.787
	Performance expectancy	-If I use products (or services) applied with IIT, I will be able to do my work (work, study, games, information search, etc.) more efficiently. -If I use products (or services) applied with IIT, I will be able to do what I want faster.	0.870	3.801	0.728
Technological factor	Perceived usefulness	-Products (or services) with IIT will be useful to me. -It would be more helpful for me to use a product (or service) applied with IIT than other tools.	0.859	3.870	0.737
	Perceived ease of use	-I think products (or services) with IIT are easy to use. -I think products (or services) which are applied with IIT are convenient to use.	0.838	3.620	0.788
	Technology complexity	-Using a product (or service) to which IIT is applied seems to be complicated. -Products (or services) to which IIT is applied are difficult to use because of their many functions.	0.880	2.847	0.900
	Radical innovation	-Products (or services) applied with IIT are innovative. -Products (or services) to which IIT is applied are newly ingenious and creative.	0.828	3.840	0.729
	Relative advantage	-The product (or service) to which IIT is applied seems to be a better technology than the product (or service) to which the existing technology is applied. -The product (or service) to which IIT is applied seems to be more useful than the product (or service) to which the existing technology is applied.	0.813	3.819	0.665
Resource factor	Price value	-I am well aware of the strengths and weaknesses of products (or services) to which IIT is applied. -I am well aware of products (or services) applied with IIT.	0.782	3.144	0.813
	Education level	-What is your final education level?		0.652	0.476
	Income	-What is your household's gross monthly income?		6.032	0.630
	Experience of use	-Total number of IIT devices possessed		3.163	1.805
	Facilitating conditions	-I will be able to receive detailed guidance when using the product (or service) applied by IIT. -If I have a difficult problem while using a product (or service) applied with IIT; I will be able to get help from people or experts around me.	0.779	3.516	0.692

Table 3. *Cont.*

Factor	Variable	Question	Reliability	Mean	SD
Risk Perception factor	Perceived risk	-The changes that a product (or service) applied with IIT will bring gives me fear. -When I think about the changes that a product (or service) applied with IIT will bring, it is somewhat scary.	0.866	2.558	0.928
	Perceived benefit	-Products (or services) with IIT are worth using. -It will be valuable to me to use a product (or service) applied with IIT.	0.816	3.986	0.698
	Image of technology (positive)	-I think positively about using products (or services) with IIT applied. -I have a favorable feeling about using products (or services) to which IIT is applied.	0.865	3.685	0.721
	Knowledge	-Using IIT products (or services) has a greater cost advantage than the cost of use. -It seems that the benefits gained compared to the effort spent using products (or services) applied with IIT will be greater.	0.786	3.515	0.739
	Trust in government	-The government pays attention to issues related to IIT for the public. -The government is preparing for the changes caused by IIT for the people.	0.865	3.120	0.861
Value factor	Science and Technology Optimism	-IIT makes our lives healthier and more convenient. -IIT performs positive functions rather than negative functions.	0.750	3.688	0.699
	Eco-centralism	-Economic development takes priority over environmental preservation. -We should develop the economy first and then protect the environment.	0.840	2.572	1.009
	Anthropocentrism	-Humans are superior to other living things. -Humans are great.	0.814	3.295	1.037
	Religiosity	-I am convinced of the existence of God. -I must obey God.	0.901	2.665	1.264
	Ideology (conservative)	-Ideological position recognition		5.196	1.629
IIT Acceptance		-I am willing to purchase products using IIT. -I think positively about purchasing products using IIT. -If I can afford to purchase products using IIT, I would like to buy them. -Our society needs to actively use IIT. -Our society should use IIT in various places. -Our society should gradually increase the use of IIT.	0.912	3.700	0.654

3. Results

3.1. Descriptive Analysis

A simple frequency analysis was conducted to analyze respondents' attitudes toward the acceptance of IIT. Figure 1 is the frequency table analyzed after changing from a 5-point scale to a 3-point scale in response. In six statements, the IIT acceptance rate exceeded 50%, indicating that respondents were positive about IIT. Among the six items, the item with the highest level of consent was the item regarding the social use of IIT technology (item 1), whereas the lowest item was related to purchase intention. These results suggest that they showed a more acceptable attitude toward social use that was not directly related to their own interests. On the other hand, it appears that people were cautious about the way in which individual payments are made. It should be noted that, in all six statements, the rate of approval was the highest, followed by a large number of respondents with neutral positions, and the rate of opposition to use was very low.

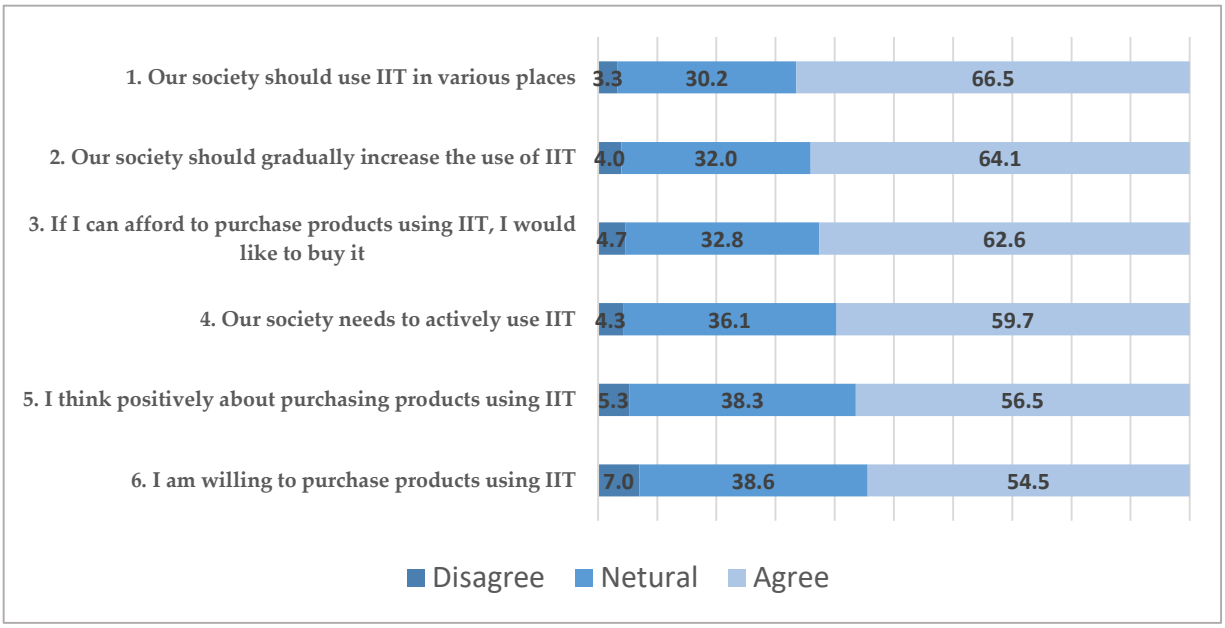

Figure 1. Frequency of acceptance.

To analyzed the extent to which the degree of IIT acceptance varies according to five factors, the respondents were divided into a group above the means (high group) and a group below it (low group) in each variable of the five factors. Table 4 presents how the frequency and mean of acceptance varied according to each variable.

In the case of psychological factors, the high groups in terms of individual innovativeness, motivation, self-efficacy, voluntariness, and performance expectancy showed higher technology acceptance than the corresponding low groups. The proportion of respondents who thought positively about technology in the high groups was high, ranging from 50.0% to 78.4%. On the other hand, among respondents in the low groups, neutral opinions about technology dominated, ranging from 65% to 79%. It is remarkable that the percentage of respondents who were negative to acceptance was low regardless of whether they belonged to a high or low group. In particular, there was a wide gap in acceptance between the high and low group (78.4% versus 7.1%) in terms of voluntariness.

In the case of technology factors, the high group—who felt the usefulness and experienced the ease of use—was more likely to evaluate IIT as having attributes of radical innovation and evaluate the relative advantage as being generally more positive for IIT acceptance compared to those in the low group. For example, 58.2% of those in the high group who perceived the usefulness of technology as being high were positive toward acceptance, but only 13.0% in the low group expressed support for technology. On the other hand, in terms of technological complexity, those who thought that digital information technology was complex expressed a more negative attitude toward acceptance.

Regarding resource factors, respondents who own more resources in terms of price value, education level, income, experience of use, and facilitating conditions are more positive about IIT than those who do not. However, the attitude toward acceptance depends on the type of resource; when there are many resources in terms of price value or promotion conditions, the acceptance rates for IIT are high, at 63.8% and 68.7%, respectively. Between the higher and lower groups, there were large gaps of 36.5% (63.6% − 27.1%) in price value and 45.1% (68.7% − 23.6%) in facilitating conditions. On the other hand, there was a small gap, 10.4%, between the higher (45.9%) and lower groups (35.7%) in terms of income.

Table 4. Frequency and mean according to high and low groups.

Classified			Frequency				Mean	
			Negative	Neutral	Positive	Chi Square	Mean	ANOVA
Psychological factor	Personal innovativeness	High group Low group	2.40% 10.90%	33.10% 63.50%	64.50% 25.70%	312.098 ***	2.620 2.148	343.391 ***
	Intrinsic motivation	High group Low group	1.80% 13.30%	32.50% 70.30%	65.70% 16.50%	517.019 ***	2.639 2.032	653.719 ***
	Self-efficacy	High group Low group	3.10% 10.80%	33.20% 65.20%	63.70% 24.00%	326.140 ***	2.605 2.132	350.893 ***
	Voluntariness of use	High group Low group	0.70% 13.60%	20.90% 79.20%	78.40% 7.10%	1051.754 ***	2.777 1.935	1808.996 ***
	Performance expectancy	High group Low group	2.60% 15.10%	38.30% 70.80%	59.00% 14.10%	419.647 ***	2.564 1.991	518.271 ***
Technological factor	Perceived usefulness	High group Low group	3.30% 14.50%	38.40% 72.50%	58.20% 13.00%	404.529 ***	2.549 1.984	484.13 ***
	Perceived ease of use	High group Low group	3.50% 10.90%	37.60% 63.00%	58.90% 26.10%	228.433 ***	2.553 2.152	242.342 ***
	Complexity	High group Low group	7.80% 6.30%	59.70% 35.40%	32.50% 58.30%	131.050 ***	2.247 2.520	99.487 ***
	Radical innovation	High group Low group	4.00% 12.20%	37.60% 69.70%	58.40% 18.10%	326.148 ***	2.544 2.059	355.806 ***
	Relative advantage	High group Low group	3.00% 14.40%	37.70% 71.60%	59.30% 14.00%	418.243 ***	2.564 1.996	507.028 ***
Resource factor	Price value	High group Low group	2.60% 10.60%	33.80% 62.30%	63.60% 27.10%	273.494 ***	2.610 2.166	294.735 ***
	Education level	High group Low group	6.60% 8.50%	47.50% 55.80%	45.90% 35.70%	19.659 ***	2.393 2.272	18 ***
	Income	High group Low group	5.30% 9.40%	46.40% 54.70%	48.30% 35.90%	36.484 ***	2.430 2.265	37.04 ***
	Experience of use	High group Low group	4.30% 5.80%	40.30% 51.20%	55.50% 43.00%	15.081 ***	2.513 2.372	13.808 ***
	Facilitating conditions	High group Low group	2.40% 10.70%	28.90% 65.70%	68.70% 23.60%	410.323 ***	2.663 2.129	456.497 ***
Risk perception factor	Perceived risk	High group Low group	7.50% 7.00%	63.20% 38.40%	29.20% 54.70%	137.610 ***	2.217 2.477	94.623 ***
	Perceived benefit	High group Low group	3.20% 16.30%	40.50% 72.50%	56.30% 11.20%	393.978 ***	2.531 1.948	482.753 ***
	Positive image of technology	High group Low group	0.90% 14.70%	28.60% 76.10%	70.50% 9.20%	794.871 ***	2.696 1.944	1204.779 ***
	Knowledge	High group Low group	3.60% 9.90%	35.30% 61.20%	61.10% 29.00%	209.413 ***	2.575 2.191	212.415 ***
	Trust in government	High group Low group	2.60% 10.30%	37.00% 59.00%	60.40% 30.70%	183.814 ***	2.579 2.205	196.054 ***
Value factor	Science and technology optimism	High group Low group	2.20% 12.60%	32.50% 69.40%	65.30% 18.00%	472.619 ***	2.631 2.055	571.446 ***
	Eco-centralism	High group Low group	5.60% 8.70%	55.00% 46.30%	39.40% 45.00%	17.769	2.338 2.362	0.780
	Anthropocentrism	High group Low group	5.00% 9.50%	42.80% 58.10%	52.10% 32.40%	83.113 ***	2.471 2.229	81.881 ***
	Religiosity	High group Low group	6.70% 7.80%	53.70% 47.10%	39.60% 45.10%	8.760 *	2.329 2.373	0.111
	Ideology (conservative)	High group Low group	8.00% 6.80%	50.00% 50.70%	42.00% 42.60%	1.086	2.340 2.358	0.425

* $p < 0.05$, *** $p < 0.001$.

In the case of the risk perception factor of perceived risk, those who reported higher perceived risk displayed more acceptance than those who reported low perceived risk. In the group with low perceived risk, technology acceptance for IIT was high, and in the group with high perceived benefit, positive technology image, knowledge, and trust in government, the acceptance was high. The fact that there was a large gap in acceptance (79.5% − 9.2% = 70.3%) between groups with high and low positive images of technology implies that it is important to manage emotional image in technology acceptance.

Regarding science and technology optimism, anthropocentrism, and religiosity, the differences in frequency between the high and low groups were statistically significant. However, in the cases of eco-centralism and ideology, the differences in frequency between groups were not significant. It is worth noting that science and technology optimism showed a large gap in acceptance between high and low groups. These results suggest that the issue of acceptance of science and technology is not related to the ideological dimension, but that it is instead related to the fundamental question of the philosophy of science and technology and humanism.

3.2. Correlation Analysis

To determine the relationships between variables, we conducted a simple Pearson correlation analysis, and the results are listed in Table 5 below. The last row in Table 5 shows the relationship between IIT acceptance and other variables. It can be seen that there was a large variation in the value of the correlation coefficient. IIT acceptance showed no statistically significant relationship with eco-centralism, religiosity, or ideology.

Table 5. Simple Pearson correlation.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Perceived usefulness	1																								
2. Perceived ease of use	0.563 ***	1																							
3. Complexity	−0.191 ***	−0.288 ***	1																						
4. Radical innovation	0.537 ***	0.432 ***	−0.094 ***	1																					
5. Relative advantage	0.585 ***	0.491 ***	−0.159 ***	0.663 ***	1																				
6. Perceived risk	−0.203 ***	−0.193 ***	0.582 ***	−0.152 ***	−0.209 ***	1																			
7. Perceived benefit	0.732 ***	0.508 ***	−0.186 ***	0.541 ***	0.591 ***	−0.230 ***	1																		
8. Image of technology	0.524 ***	0.433 ***	−0.232 ***	0.510 ***	0.552 ***	−0.251 ***	0.556 ***	1																	
9. Knowledge	0.352 ***	0.418 ***	−0.244 ***	0.285 ***	0.293 ***	−0.092 ***	0.375 ***	0.399 ***	1																
10. Trust in government	0.190 ***	0.197 ***	0.003	0.248 ***	0.206 ***	0.019	0.167 ***	0.288 ***	0.279 ***	1															
11. Personal innovativeness	0.450 ***	0.515 ***	−0.275 ***	0.421 ***	0.433 ***	−0.170 ***	0.462 ***	0.483 ***	0.452 ***	0.211 ***	1														
12. Intrinsic motivation	0.556 ***	0.470 ***	−0.184 ***	0.507 ***	0.510 ***	−0.134 ***	0.568 ***	0.557 ***	0.500 ***	0.237 ***	0.567 ***	1													
13. Self-efficacy	0.324 ***	0.362 ***	−0.278 ***	0.267 ***	0.321 ***	−0.177 **	0.350 ***	0.459 ***	0.264 ***	0.121 ***	0.545 ***	0.406 ***	1												
14. Voluntariness of use	0.508 ***	0.409 ***	−0.228 ***	0.457 ***	0.518 ***	−0.241 ***	0.524 ***	0.709 ***	0.440 ***	0.247 ***	0.499 ***	0.586 ***	0.475 ***	1											
15. Performance expectation	0.568 ***	0.468 ***	−0.152 ***	0.572 ***	0.618 ***	−0.190 ***	0.576 ***	0.577 ***	0.520 ***	0.211 ***	0.492 ***	0.573 ***	0.343 ***	0.535 ***	1										
16. Price value	0.615 ***	0.568 ***	−0.144 ***	0.491 ***	0.538 ***	−0.097 ***	0.536 ***	0.451 ***	0.367 ***	0.279 ***	0.452 ***	0.500 ***	0.264 ***	0.440 ***	0.520 ***	1									
17. Education	0.073 **	0.089 ***	−0.057 *	0.031	0.031	−0.044 *	0.093 ***	0.093 ***	0.065 **	−0.048 *	0.109 ***	0.061 **	0.118 ***	0.078 **	0.065 **	0.168 ***	1								
18. Income	0.118 ***	0.118 ***	−0.093 ***	0.136 ***	0.138 ***	−0.101 ***	0.148 ***	0.154 ***	0.123 ***	0.036	0.169 ***	0.128 ***	0.143 ***	0.154 ***	0.158 ***	0.148 ***	0.203 ***	1							
19. Experience of use	0.151 ***	0.183 ***	−0.110 **	0.078 *	0.130 ***	−0.046	0.143 ***	0.151 ***	0.185 ***	0.077 *	0.210 ***	0.220 ***	0.238 ***	0.193 ***	0.148 ***	0.345 ***	0.159 ***	0.204 ***	1						
20. Facilitating conditions	0.354 ***	0.367 ***	−0.176 ***	0.408 ***	0.392 ***	−0.188 ***	0.384 ***	0.499 ***	0.358 ***	0.305 ***	0.390 ***	0.368 ***	0.437 ***	0.470 ***	0.437 ***	0.322 ***	0.050 *	0.097 ***	0.177 ***	1					
21. Science and technology optimism	0.568 ***	0.520 ***	−0.186 ***	0.576 ***	0.620 ***	−0.222 ***	0.564 ***	0.547 ***	0.592 ***	0.294 ***	0.452 **	0.500 **	0.264 **	0.440 **	0.520 **	0.400 ***	0.053 *	0.141 ***	0.148 ***	0.403 ***	1				
22. Eco-centralism	0.001	0.004	0.114 ***	0.017	−0.028	0.139 ***	−0.029	0.027	0.084 ***	0.133 ***	0.097 ***	0.089 ***	0.073 **	0.047 *	0.002	0.152 ***	−0.033	−0.02	0.108 **	0.048 *	0.079 ***	1			
23. Anthropocentrism	0.195 ***	0.141 ***	0.108 ***	0.272 ***	0.230 ***	0.064 **	0.163 ***	0.216 ***	0.202 ***	0.235 ***	0.149 ***	0.187 ***	0.081 ***	0.165 ***	0.216 ***	0.079 ***	−0.074 **	0.016	−0.013	0.221 ***	0.237 ***	0.277 ***	1		
24. Religiosity	0.029	0.04	0.133 ***	0.016	0.003	0.177 ***	−0.02	−0.023	0.089 ***	0.112 ***	0.027	0.012	−0.005	−0.026	0.011	0.025	0.039	−0.035	0.059	−0.007	0.017	0.095 ***	0.266 ***	1	
25. Ideology	−0.033	−0.029	0.083 ***	−0.019	−0.037	0.067 **	−0.052 *	−0.009	0.007	−0.081 ***	−0.015	−0.024	−0.070 **	−0.057 *	−0.012	−0.013	−0.047 *	−0.028	0.034	−0.012	0.023	0.200 ***	0.114 ***	0.105 ***	1
26. Acceptance	0.565 ***	0.447 ***	−0.211 ***	0.535 ***	0.596 ***	−0.240 ***	0.576 ***	0.763 ***	0.489 ***	0.291 ***	0.496 ***	0.603 ***	0.466 ***	0.827 ***	0.614 ***	0.414 ***	0.092 ***	0.169 ***	0.214 ***	0.526 ***	0.585 ***	0.033	0.227 ***	−0.021	−0.032

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Among the five variables in technological factor, IIT acceptance had a high positive correlation with relative advantage (0.596). It also had high positive correlations with perceived usefulness, perceived ease of use, and radical innovation, but it had a negative relationship with complexity (−0.211).

In the risk perception factor, acceptance had a negative correlation with perceived risk, whereas it had a positive correlation with perceived benefit, positive image of technology, knowledge, and trust in government. IIT acceptance had a particularly high correlation (0.763) with a positive image of technology. As mentioned earlier, these results suggest that emotional judgment may be more important than rational judgment in IIT acceptance.

Variables belonging to psychological factors showed a high positive correlation with IIT acceptance. Acceptance showed the highest correlation with voluntariness of use, followed by performance expectancy, intrinsic motivation, personal innovativeness, and self-efficacy.

In the resource factor, the correlation differed depending on the variable. IIT acceptance had high correlations with price value and facilitating conditions, but it showed low correlations with education level and income. The first two variables were resources that had a very direct relationship with IIT, whereas the latter two variables had no direct relationship with it.

Finally, IIT acceptance had a high positive correlation with science and technology optimism, and it had a positive relation with anthropocentricism. On the other hand, econ-centralism, religiosity, and ideology were statistically irrelevant to IIT acceptance.

Looking at all variables at once, IIT acceptability showed the highest correlation with voluntariness of use, followed by positive image of technology, performance expectancy, intrinsic motivation, relative advantage, science and technology optimism, and the perceived benefit of radical innovation. These results suggest that IIT acceptance is not related to one factor alone, but to various factors.

3.3. Causal Analysis

Causal analysis based on hierarchical regression analysis was conducted, and the results are presented in Table 6 below. The purpose of this study was to understand the effects of the five factors (technology, psychology, resources, risk perception, and value) on IIT acceptance. Therefore, we conducted hierarchical regression analysis to determine the effectiveness and influence of each factor.

Table 6. Hierarchical regression analysis.

Factor	Variable	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
		B	SE	Beta	B	SE	Beta	B	SE	Beta	B	SE	Beta	B	SE	Beta	B	SE	Beta	B	SE	Beta
	Constant	3.651 ***	0.069		0.602 ***	0.06		1.254 ***	0.096		1.159 ***	0.193		0.590 ***	0.084		1.911 ***	0.092		0.215	0.143	
Control	Sex	−0.192 ***	0.029	−0.147	−0.066 ***	0.015	−0.05	−0.120 ***	0.022	−0.092	−0.115 ***	0.033	−0.089	−0.034	0.018	−0.026	−0.132 ***	0.024	−0.101	−0.017	0.021	−0.013
	Age	0.007 ***	0.001	0.15	0.004 ***	0.001	0.083	0.003 **	0.001	0.051	0.005 ***	0.001	0.11	0.004 ***	0.001	0.084	0.002 *	0.001	0.048	0.003 **	0.001	0.053
Psychological factor	Personal innovativeness				0.007	0.013	0.008													−0.024	0.021	−0.029
	Intrinsic motivation				0.070 ***	0.013	0.089													0.028	0.018	0.034
	Self-efficacy				0.052 ***	0.013	0.056													0.027	0.019	0.029
	Voluntariness of use				0.524 ***	0.013	0.63													0.402 ***	0.02	0.478
	Performance expectancy				0.172 ***	0.013	0.191													0.079 ***	0.021	0.086
Technological factor	Perceived usefulness							0.210 ***	0.02	0.236										0.025	0.023	0.027
	Perceived ease of use							0.057 **	0.018	0.069										−0.005	0.018	−0.006
	Complexity							−0.058 ***	0.013	−0.08										0.007	0.015	0.011
	Radical innovation							0.164 ***	0.021	0.183										0.046 *	0.02	0.051
	Relative advantage							0.269 ***	0.024	0.273										0.055 *	0.024	0.056
Resource factor	Price value										0.269 ***	0.023	0.314							−0.023	0.019	−0.026
	Education										0.063	0.036	0.045							0.038	0.023	0.028
	Income										0.042	0.027	0.04							−0.007	0.017	−0.006
	Experience of use										0.027 **	0.01	0.074							0.014 *	0.006	0.039
	Facilitating conditions										0.347 ***	0.025	0.369							0.035	0.019	0.037
Risk perception factor	Perceived risk													−0.029 **	0.01	−0.041				−0.02	0.014	−0.029
	Perceived benefit													0.171 ***	0.016	0.182				0.005	0.023	0.005
	Image of technology													0.523 ***	0.016	0.575				0.221 ***	0.023	0.236
	Knowledge													0.090 ***	0.013	0.112				0.012	0.021	0.015
	Trust in government													0.050 ***	0.011	0.065				0.017	0.013	0.023
Value factor	Science and technology optimism																0.514 ***	0.017	0.549	0.02	0.021	0.021
	Eco-centralism																−0.021	0.012	−0.033	−0.006	0.011	−0.01
	Anthropocentrism																0.067 ***	0.013	0.106	0.012	0.011	0.02
	Religiosity																−0.026 **	0.01	−0.05	0.009	0.008	0.018
	Ideology																−0.022 **	0.007	−0.055	−0.003	0.006	−0.008
	F value	48.121 ***			821.960 ***			246.305 ***			90.028 ***			497.730 ***			167.228 ***			126.341 ***		
	R^2	4.60%			74.30%			46.40%			38.80%			63.60%			37%			77.80%		
	Adj R^2	4.50%			74.20%			46.20%			38.40%			63.50%			36.80%			77.20%		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Model 1 shows the effects of gender and age as control variables on IIT acceptance. The results showed that women were negative in terms of their IIT acceptance, which can be interpreted as a result of women feeling relatively more difficulty with technology than men. It was found that the older the age, the more positive the technology acceptance. This result can be interpreted as older people valuing IIT positively because they believe they will be out of date if they do not accept the latest new technology. The explanatory power of Model 1 was 4.6%.

Model 2 shows causal associations between psychological factors and IIT acceptance. The results show that the more intrinsic motivation, self-efficacy, voluntariness, and performance expectancy people have, the more positive acceptance of IIT they have. Those findings confirmed the results of previous studies indicating that intrinsic motivation and performance expectancy were positively related to technology acceptance. Although self-efficacy has mainly been used as an external variable for explaining the acceptance [31,36,43–46], this study proved that self-efficacy is a direct variable for acceptance. Voluntariness has also been used as a moderating variable, rather than a direct one, in technology acceptance [48,50,51], but this study confirms the direct effect of voluntariness on technology acceptance. In terms of the standardized beta coefficient, voluntariness of use had the greatest influence on acceptance, followed by performance expectancy. The overall explanatory power of Model 2 was 74.3%, which is quite high.

Model 3 shows the effects of different technological factors on technology acceptance. The results of the analysis showed that technology usefulness, ease of use, radical innovation, and relative advantages all had a positive influence on IIT acceptance. However, the more complex people feels that the technology is, the more negative impact it has on technology acceptance. Among the technical factors, relative advantages and perceived usefulness showed high influences on acceptance, whereas perceived ease of use and technological complexity had low effects on acceptance. The overall explanatory power of Model 3 was 46.4%.

Model 4 presents the results of the causal analysis between resource factors and technology acceptance. The more that people perceive that the price of IIT was worthwhile (price value), the more experience they had of owning a device (experience of use), and the more they recognized that people could receive help from others when using digital technology (promotional conditions), the more positive was their attitude toward IIT acceptance. Among the five predictors, facilitating conditions were found to have the greatest influence on technology acceptance, followed by price value. Experience is used not as a direct variable, but rather as a moderating variable UTAUT, TAM2, and UTAUT2 [18,19,21]. We confirmed Agarwal and Prasad's [69] findings in which experience is a variable that directly affects technology acceptance. The overall explanatory power of Model 4 was 38.3%.

Model 5 shows that all variables among risk perception factors had a causal effect on technology acceptance. Perceived benefit, positive image of technology, knowledge, and trust in government all had positive effects on technology acceptance, excluding perceived risk. In particular, compared to other variables, the image of technology had a very large influence on the IIT acceptance. As digital information technology becomes increasingly personalized, emotional images of technology have a greater impact on individual acceptance. Furthermore, previous studies have demonstrated the positive role of trust in the government, as trust in the government serves to reduce the uncertainty and anxiety attributed to complex digital information technology [100,101]. The overall explanatory power of Model 5 was 63.6%, thus representing the second highest explanatory power after psychological factors.

Model 6 showed causal associations between value factors and technology acceptance. Science and technological optimism, as well as anthropocentrism, both had positive impacts on technology acceptance, whereas religiosity and ideology (conservative) both had negative impacts. Among these, science-technology optimism was found to have the greatest influence on IIT acceptance. The overall explanatory power of Model 6 was 37%.

Model 7 contained all of the predictors. Among the control variables, age had a positive effect on IIT acceptance. IIT acceptance was found to be positively influenced by the psychological factors of voluntariness and performance expectancy; the technological factors of radical innovation and relative advantages; the resource factor of ownership of devices; and the risk perception factor of having a positive image of technology. According to the standardized beta coefficients, these factors affected IIT acceptance as follows, in descending order: voluntariness (0.478) < image of technology (0.236) < performance expectancy (0.086) < relative advantage (0.056) < age (0.053) < radical innovation (0.051) < experience of use (0.039).

4. Discussion

4.1. Summary

The purpose of this study was to explore how the five factors in question affected IIT acceptance. In this study, we hypothesized that not only would simple technological or psychological factors but also risk perception factors, resource factors, and value factors affect IIT acceptance. In total, 25 variables were extracted for each factor, and the influences of these variables on acceptance were compared. The results of the hypothesis testing are listed in Table 7. Of the 25 hypotheses, 19 hypotheses were accepted. Of the six hypotheses rejected, four were not statistically significant, and two resulted in contrasting results.

Table 7. Summary of hypothesis testing results.

Variable		Hypothesis	Result	Variable		Hypothesis	Result
Psychological factor	Personal innovativeness	+	Reject (N.S.)	Risk perception	Perceived risk	-	Accept
	Intrinsic motivation	+	Accept		Perceived benefit	+	Accept
	Self-efficacy	+	Accept		Positive image of technology	+	Accept
	Voluntariness of use	+	Accept		Knowledge	+	Accept
	Performance expectancy	+	Accept		Trust in government	+	Accept
Technological factor	Perceived usefulness	+	Accept	Value factor	Science and technology optimism	+	Accept
	Perceived ease of use	+	Accept		Eco-centralism	-	Reject (N.S.)
	Technology complexity	-	Accept		Anthropocentrism	+	Accept
	Radical innovation	-	Reject (+)		Religiosity	-	Accept
	Relative advantage	+	Accept		Ideology (conservative)	+	Reject (-)
Resource factor	Price value	+	Accept				
	Education level	+	Reject (N.S.)				
	Income	+	Reject (N.S.)				
	Experience of use	+	Accept				
	Facilitating conditions	+	Accept				

4.2. Discussion and Implication

The main findings and implications of this study are as follows. First, individual psychological variables substantially affected IIT acceptance. Among the 25 predictors, voluntariness was found to have the largest influence on acceptance. Many previous studies about technology acceptance have focused on usefulness and ease of use as key influential variables. However, this study confirmed that voluntariness, which has previously only been used as a moderating variable, has the greatest direct influence on acceptance. These findings suggest that self-directed voluntarism has the most influence on IIT acceptance. As technology advances, the technology acceptance is often forced rather than dependent on a free individual's choice. This study suggests that compulsory technology pushes based on involuntary responses could lead to resistance from the public.

Second, the variables of technological factors had a weak influence on the intention to accept technology. In Model 3, the variables of technological factors had a very large influence. However, in Model 7, the strong relationships between the technological variables and the acceptance were crowded out. This means that the technological dimension can provide meaningful results when using variables in a simple model such TAM. More studies that compare technological factors with other influencing factors should be conducted to examine whether the results of our findings are valid in future studies.

Third, among technological factors, radical innovation and relative advantages were statistically significant in the models. These results imply that people tend to focus on the innovative aspects of IIT, rather than the usefulness of IIT. In other words, when people encounter technology, they tend to mainly consider the difference between the new technology and old technologies. Today, innovative technologies are appearing and disappearing very quickly. This flow makes the innovativeness and relative advantage of the new product more important. As a result, competition for differentiation between technologies is expected to stress.

Fourth, among the risk perception factors, the positive image of technology had a significant effect on the intention to accept IIT. These results, as mentioned earlier, suggest that emotional affect may be more important than rationality in technology acceptance. This implies the need for a technology design that considers emotional factors in technological engineering design.

Fifth, there is a large difference in the relationship between individual value and technology acceptance. Science and technology optimism had a significant positive effect on IIT acceptance, but religiosity and ideology had negative impacts on it. Religiosity and conservatism (ideology) may be negative about change through rapid technology in that they emphasize the preservation of the past and the present.

Finally, among the five factors, the psychological factor had the greatest effect on IIT acceptance. The explanatory power of the model that only included psychological factors was the highest among the models, at 74.3%. However, the risk perception dimension of IIT should not be overlooked, because it had a significant impact on technology acceptance. The development of IIT should take into account risk factors, as the associated risks from new technology cannot inevitably increase.

5. Conclusions

In theoretical terms, our study suggests that the technological acceptance model with various dimensions was very useful in enhancing the explanatory power of the model. In previous studies, technology acceptance was often viewed as simply relying on the nature of the technical attributes. Technology is not simply an issue in science and technology itself, but it has strong attributes of social constructs. Therefore, it is important to look at the problem of how technology is accepted by society. In this study, it was found that factors such as resources and values play an important role in IIT acceptance at the social level. In this vein, for better technology development, it is necessary to form a discourse at the social level. Public participation in the technology development process may also prove to be important.

In terms of practical applications, our findings imply that the government should play a role in making IIT acceptable. This study showed that (a) The more difficult it was to use the technology, the more negative the attitude toward IIT was. (b) Facilitating conditions, which refers to resource conditions that help in using the technology, have a positive effect on the acceptance of the technology. (c) Trust in government has a positive influence on technology acceptance. These results suggest that the government should improve the convenience of use through encouraging the standardization of technology, reinforcing education to increase familiarity with and expertise in IIT, and increasing trust in the government itself. The core of advanced IIT is automation. For example, advanced precision processing technology enables even the automation of language analysis formed through social networking [116].

Although new information and communication technologies provide positive benefits to mankind, they have negative aspects such as social inequality, job losses, and invasions of privacy. For the sustainable development of mankind, the human aspect should be emphasized in IIT. This study provides a clue for the humanization of IIT. In order to increase the acceptability and sustainability of IIT, it is necessary to emphasize the voluntariness of use and enhance the relevant experience in this area, and to strive to make a user-friendly image of it.

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