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Conceptualizing Blockchain Technology in Utilization of Social Welfare Service for the Disabled

Namjin Kim[1] & Ahreum Hong[2]

[1] Graduate School of Technology Management, Kyung Hee University, Gyunggido, Korea

[2] Assistant Professor, Graduate School of Technology Management, Kyung Hee University, Gyunggido, Korea

Correspondence: Ahreum Hong, Graduate School of Technology Management, Kyung Hee University, 1732 Deokyoung-ro Yongin-si Gyunggi-do, South Korea. Tel: 82-31-201-2145. Fax: 82-31-201-2777. E-mail: arhong@khu.ac.kr

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Abstract

This study analyzed factors influencing acceptance intention for blockchain technology in social welfare services for the disabled. Security and economics were the leading variables related to blockchain technology acceptance. Willingness to pay, fairness, and regulation were the leading variables reflecting characteristics of public services. UTAUT (Unified Theory of Acceptance and Use of Technology) was used as a research model, and performance expectations, effort expectations, and social impact were considered. Based on the blockchain-based virtual disabled voucher process, this study utilized prior knowledge based on the use of rehabilitation center. The STATA / SE 12.0 statistical program was used to analyze demographic frequency, factor analysis, reliability, and structural equation modeling (SEM). Pay-out and fairness have the greatest influence on acceptance intention, and economic and regulatory factors are the next influential factors. Only economic performance has been identified as a leading variable influencing the expectations of effort, and security has been shown to affect only social impact. Economic performance influenced performance expectation, effort expectation, and social influence. Expectation of effort did not affect acceptance intention. This study provides useful information for establishing a practical strategy when introducing blockchain technology to the public service called disabled welfare.

Keywords: blockchain technology, welfare services for the disabled, ICT regulatory

1. Introduction

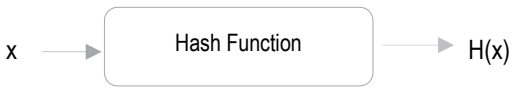
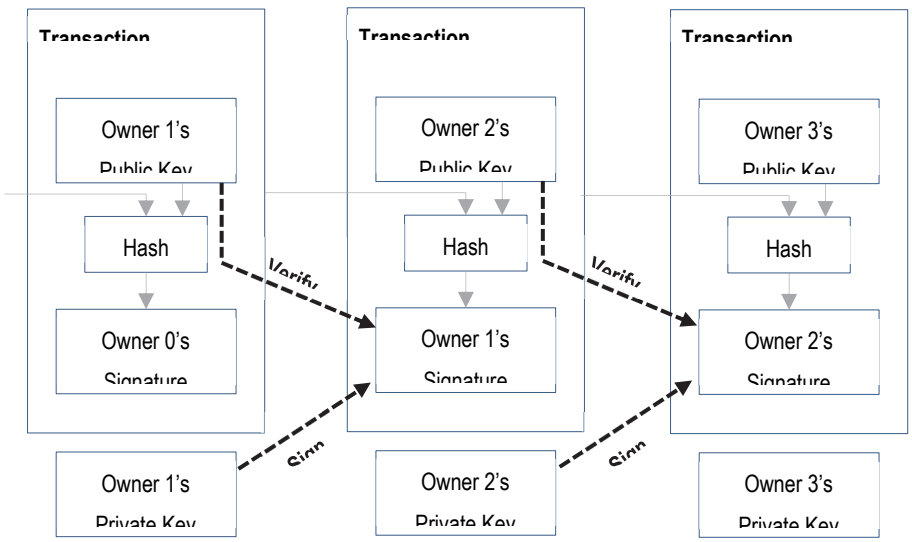
Internet technology has spread and strengthened connectivity globally, but the risks of monopoly and single failure are increasing as information and wealth become increasingly inequitable (Don Tapscott & Alex Tapscott, 2016). In addition, the development of technology has established a mass surveillance system for terrorism and security reasons. Beyond criminal activity, the general public is a target and privacy violations are becoming a serious problem. Privacy is the essence of society, the foundation of freedom and prosperity, and is important to our actions (Ann Cavoukian, 2016). With the development of internet technology, the Cypherpunk movement that started with concern about personal privacy became the birthplace of new network technology. In October 2008, just after the global financial crisis, anonymous writer Satoshi Nakamoto published a bitcoin white paper (Michael J Casey, Paul Vigna, 2016). Blockchain technology, characterized by reliability, availability, transparency, invariance, and digital characteristics, reduces costs by eliminating third parties and increases innovation potential in key industries (David Schatsky and Craig Muraskin, 2015). Contemporary society with its expanding connectivity is faced with problems that individuals and communities cannot solve, including wars, environmental pollution that affects climate change and destruction of natural ecosystems, the collapse of the economic systems, and the emergence of pathogens. Urich Beck (1986) argued that the development of the industry created a 'dangerous society' in which no one is free of risk beyond individual control. Humans exposed to these risks are suffering from inherited or acquired disabilities. Disability is a problem for all of us, as 90% of people with disabilities are severely disabled (Yoo Hae-sook, JeonDong-il 2008). Since the mid-2000s, the size of social services has increased due to the impact of aging and low fertility in terms of job creation and future growth potential (Kim Eunjung, 2013). However, there are problems such as differences in perceptions of disabled people in urban and rural areas (Kim, Seonghan, Yoon, 2005), lack of standardization, lack of integrated monitoring (Yoon Sang Yong, 2012), and illegal use of vouchers (Park Jeong Yeon). Currently, the use of blockchain technology is concentrated in the fields of financial transactions and cryptography, and the use of public key chains is relatively low (Chan-jung Park, 2018).

Utilization in the welfare of persons with disabilities is negligible, and it is difficult to find examples of empirical research. It is important to carry out empirical analysis of blockchain technology before technology introduction to welfare services for the disabled. The purpose of this study was to verify the acceptance intention for blockchain technology in welfare service for the disabled. The main characteristics of blockchain are security and economics. Willingness to pay, fairness, and regulation are factors in introducing public service technology.

2. Theoretical Background and Literature Review

2.1 Characteristics and Status of Blockchain Technology

The major theories presented in the "Bitcoin: A Peer-to-Peer Electronic Cash System" white paper published by Satoshi Nakamoto in October 2008 are summarized in Figure 1 (Nakamoto, 2008). They are as follows: decreasing anonymity and data capacity through encryption, invariance through block organization and chain structure, competition through motivation and competition among network participants without a third party structure. In his research report on distributed communication (1964), Paul Baran said that by building a command and control system that can be decentralized through redundancy of connectivity, the loss of the entire system can be minimized even if part of the system is destroyed. Beyond the decentralization of information, blockchain is a true distributed network technology. The blockchain technique is based on trust between individual transactions (two or more), and individual's interests aligning collectively without the participation of a third party. Large-scale collaboration guarantees the authenticity of the transaction. This technology can change not only the central bank and monetary system, but also the basis of national operations (Don Tapscott et al, 2017).

Principal theory	Description
Hash Function	Regardless of the input capacity, it is always converted to a fixed string and if the input value changes slightly, the output value changes significantly. 
Digital Signature	After encrypting the transactional information with the sender's private key(Signature), send a “Public Key + Signature” online. Then, the recipient can release and verify through comparison with hash value of transaction. 

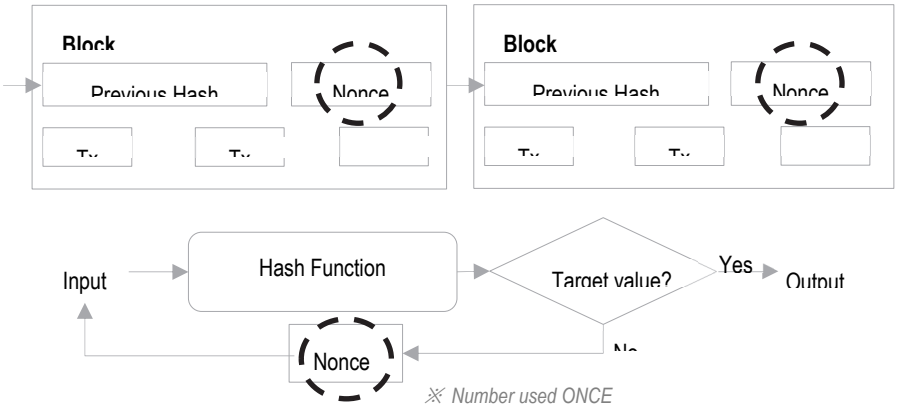
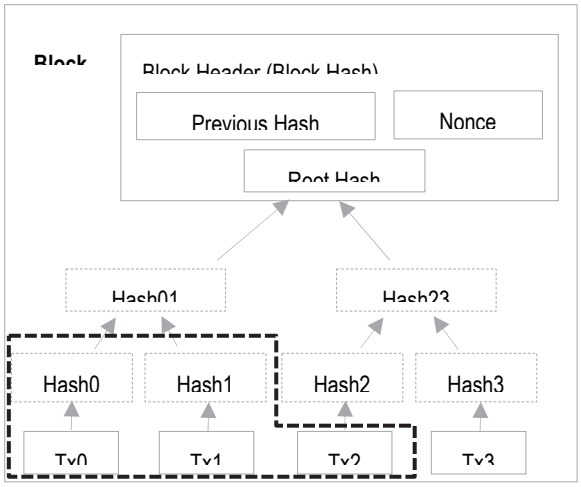
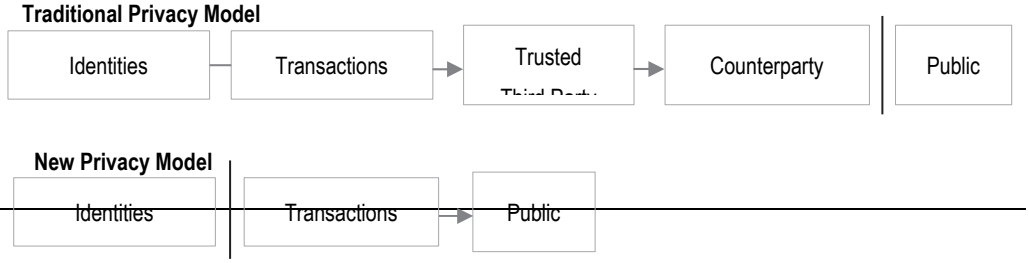
Proof of Work (Nonce)	For the proof of work regarding the transactional information, the nonce value of each block must be found. Computing power is required to find the corresponding nonce value while continuously converting the input value(arbitrary number, nonce) until the target value is reached. 
Network & Incentive	Node that is fastest to prove the work of each block among the network participants who want to verify the transactional information will receive incentive pay(Bitcoin) if it's approved by other participants' agree(motivation for network sustainability).
Disk space	By merging transactional information using Merkle Tree structure, the oldest hash can be removed (dotted line below) to minimize the storage capacity. 
Privacy	In the past, transactions were made through third parties and personal information was provided to third parties. However, personal information can be protected by anonymously holding the public key. 

Figure 1. Principal theory of Bitcoin (Nakamoto, 2008)

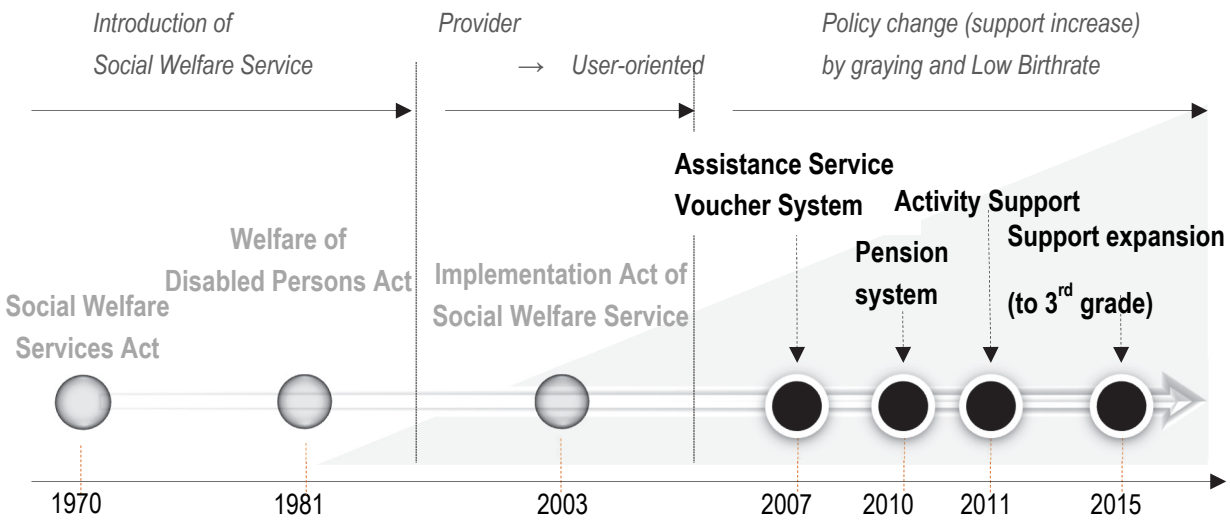
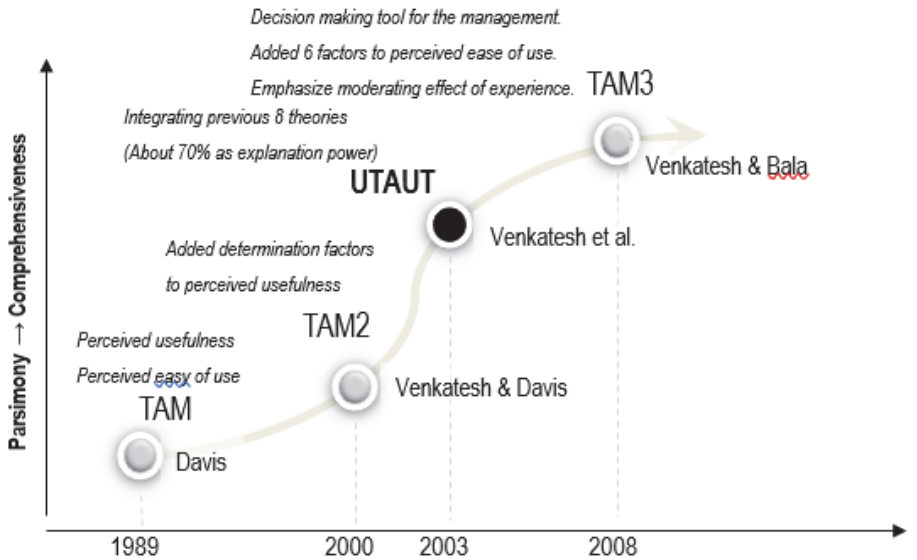


Figure 2. Trend of Social Welfare Service of South Korea



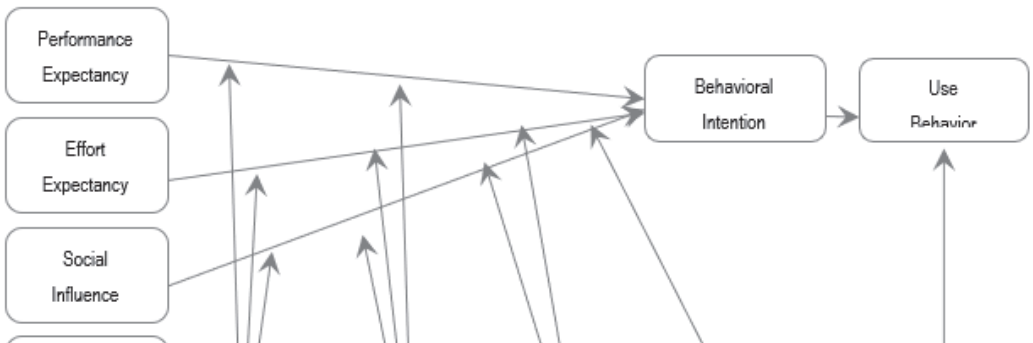


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Figure 3. Process of development of TAM and UTAUT Model

Blockchain is divided into public blockchains, private blockchains, and consortium blockchains depending on the nature and scope of network participants. A public blockchain is a fully decentralized structure in which anyone can participate in a transaction and authenticate the transaction legitimacy through proof of work without the permission of the specific organization. A private blockchain is a centralized structure in which an authority is authorized by the owner in the form of full authority. The consortium blockchain is a partially decentralized structure that is traded by the consent of each institution in a form controlled by pre-selected participants (Kim, Jin-Wan, 2016).

The blockchain is a structure that enables inter-individual transactions without the involvement of a third party and can be summarized as a technology capable of enhancing network efficiency and securing reliability characteristics including anonymity, dispersibility, transparency, and invariance. Table 1 shows the definitions and characteristics of the blockchain technology, and Table 2 shows the types of blockchain projects that governments in each country are promoting. The Ministry of Science and Technology (MIC) (2018) presented a vision as a 'country that innovates and grows into a blockchain,' and announced a strategy to promote public and private business efficiency and the creation of a blockchain industrial development ecosystem by 2020.

Table 1. Definition and characteristic of Blockchain Technology

Researcher	Definition and characteristic
Yeigoo, Kim (2015)	A technology of maintaining the integrity that all members (nodes / peers) share the same ledger containing all the transactional information, and update it simultaneously whenever a new transaction occurs. It's possible to solve 'single point of failure' problem caused by relying on authorized third party.
David Schatsky et al (2015)	It is a digitized and distributed transaction book that is maintained in multiple participant's computer systems. It has reliability, availability, transparency, immutability, and digital characteristics. It reduces cost and increases the potential for innovation in major industries by removing the third parties.
Myung Hwan Rim (2016)	A ledger that records transactions is stored in a distributed manner by each member (node / peer), and when a new transaction occurs, the book is updated in the same time as the cryptographic method, so that conceptually an anonymous and secure digital public book or Distributed Ledger.
Seungwha Chung (2016)	Blockchain technology is a Digital Distributed Ledger, in which traders who record transaction information are distributed to an online P2P Network instead of a third party or a central server. The network participants record and manage transactional information using it and it's periodically updated. De-centralization, efficiency, scalability, security, and transparency are advantage points but regulation environment, insufficient technical consensus, inability to cancel in accidental transactions, excessive introduction costs,

	constraints on scalability and delay in resolving differences are weak points.
Jung suk Kim (2017)	A distributed technology in which the validated blocks (data) are linked together and P2P Network participants (nodes) record and manage data jointly. Five characteristics of security, availability, reliability, diversity and economy.
Jun young Kang (2017)	A digital ledger that stores peer-to-peer transactions on all computers on the network. It has the advantage of being able to deal directly without intermediaries, and has the advantage of speed and cost saving. It's possible to solve security problems.
Michael J.Casey et al (2017)	If the role of the central bank is reduced, fiscal spending through the issuance of government bonds will be affected, and securing of tax revenue can also be a problem. In addition, a total rejection of the government may lead to new monopolies or centralization, even if it's virtual money technology based on distributed network, which may again control the future economy.
Sung Min Rue (2018)	The characteristic of sharing of the ledger leads to the primary value of 'prevention of forgery', the secondary value of 'reliability' and the tertiary value of 'cost reduction & simplicity'. The blockchain can solve the problems of the fourth industrial revolution such as invasion of privacy, inefficient cost and the problem of "Big Brother".
Yun Seung Ko (2017)	It is characterized by its blockchain technology, which can be divided into seven types: dispersibility(transaction in P2P environment), efficiency(maintenance cost reduction), scalability(establishment of network participants, extension of connection), transparency(public access to all transaction records), security(All participants in the network jointly own transaction books), stability (distributed network structure), immutability(data recorded by blockchain can't be changed).
Hyojin Kang (2018)	A technology that ensures the integrity and reliability of transaction records without any authorized third party by verifying, recording and archiving transaction information jointly by all participants in the network. Advantages include improved security, lowered costs, improved transaction speed, and maximized visibility. Disadvantages include the need for enormous amounts of computing power, the inefficiency of distributed storage, the limitations of scalability, the exposure to privacy and the limitations of anonymity.
Soonduck Yoo (2018)	The blockchain can be described in comparison with the plant ecosystem, the key components are service providers (producers), service users (consumers), and distributed ledger owners (decomposers). It is important to establish an environment where the ledger owner (decomposer) can secure efficiency.

Table 2. Government lead Blockchain Project of each nation (Young Im Bae et al, 2018)

Service Category	**Government(organization)**
Digital ID/ Permanent residency	Dubai, Estonia, Switzerland, the United States
Financial (Securities) transaction/ Asset	Australia, China, France, UAE, Saudi Arabia, the United Kingdom, the United States(Dalloway), Russia, Singapore
Social Security Fund Management	China
Welfare benefit payment	The United Kingdom
Real Estate/ Land Asset Management	China(mortgage assessment), Ghana, Georgia, Honduras, Sweden

Government document record and management	Dubai, Russia
Trade transaction	Dubai, Singapore
Medical information	Estonia, the United States
Government Electronic voting/ stockholder voting	Estonia, Ukraine, Denmark, Russia, Spain, the United States(Texas), London stock Exchange, Abu Dhabi stock Exchange, NASDAQ
Auction	Ukraine

Table 3. Types of Disability and Registration status by grade (The ministry Health and Welfare, As of Dec. 31 2017)

Type	1st	2nd	3rd	4th	5th	6th	Total
Physical Disability	33,862	63,998	151,482	238,489	364,582	401,717	**1,254,130**
Visual Impairment	31,845	6,535	11,342	13,149	20,534	169,227	**252,632**
Hearing Impairment	6,973	45,141	43,040	70,283	92,515	44,051	**302,003**
Speech Impairment	139	2,252	8,260	9,666	3	1	**20,321**
Intellectual Disability	50,428	70,226	80,249	0	0	0	**200,903**
Brain-Disabled	56,171	49,638	56,405	31,976	30,066	28,563	**252,819**
Autistic	10,282	10,683	3,733	0	0	0	**24,698**
Mental Disorder	2,188	28,497	70,490	0	0	0	**101,175**
Kidney Disorder	5,011	57,967	59	717	19,808	0	**83,562**
Cardiac Lesion	127	658	3,789	47	778	0	**5,399**
Respiratory Lesion	1,730	3,402	6,498	7	170	0	**11,807**
Hepatopathy	202	271	510	346	10,514	0	**11,843**
Facial Disorder	99	420	898	1,180	93	2	**2,692**
Intestinal/ Urinary Fistula	6	118	1,122	9,085	4,386	1	**14,718**
Epilepsy	123	396	1,261	4,062	1,093	0	**6,935**
Total	**199,186**	**340,202**	**439,138**	**379,007**	**544,542**	**643,562**	**2,545,637**

2.2. Problems of Social Welfare Projects and Welfare Services for Persons with Disabilities

The Social Welfare Business Act was enacted in January 1970 and the Welfare Act for the Disabled was enacted in 1981. Since then, in the mid-2000s, social service policies have changed in terms of securing future growth engines and job creation in consideration of low fertility and aging, and the scale of services has increased as social services began to respond to universal needs (Kim Eunjung, 2013). In the field of welfare for the disabled, four voucher programs for disabled persons were adopted in 2007, the disability pension system was introduced in 2010, the disabled person activity support system was introduced in 2011, and the support target was expanded from grade 1 to grade 3 in 2015.

According to the Ministry of Health and Welfare, the method of providing financial support to providers providing social welfare services is changed to providing services to consumers using vouchers. In 2007, we launched a project to improve children's cognitive abilities and child obesity management services in the form of support for senior citizens, support for mothers and newborns, support for disabled persons, and community innovation projects. Although the welfare of persons with disabilities continues to evolve, there remain tasks to solve. As

shown in Table 4, it is necessary to introduce an efficient and reliable system because there are problems, including low service recognition rate, utilization rate, lack of service diversity, illegal transaction, lack of convenience, and insufficient management.

Table 4. Problem of Social Welfare Service for the disabled

Researcher	Problem	Remark
Moon Dong Kim Hee Sun Lee (2008)	The democratization of facility operation had a positive effect on all of the service quality variables. The level of treatment of the facility dwellers had a significant influence on the quality of basic living services, and the linkage with public administration had a significant effect on the quality of basic service.	
Sung Han Kim Eun Sook Yun (2009)	According to the results of survey on recognition of 16 services in Chungnam province, showed the difference in perception in income support services, additional cost support services for disability, lifelong learning facilities and services, pregnancy & delivery and childcare-related services. About thirty percent said they were not aware of the service.	Need to promote service information and all conditions
Min Kyung Lee (2012)	Despite expanding support system, recognition of support is low. Welfare needs are in the order of income, medical care, employment guarantee.	Introduction of individual management system. Introduction of the pension system for the disabled. Expansion of activity support range
You Jin Bae Seung Won Choi (2012)	Problems of Electronic Voucher System. The situation does not deviate greatly from credit card level. There are problems of payment terminal costs and transaction fees. Also, problems of card transfer, loss, and fraudulent supply & demand, which is not effective in terms of efficiency and transparency.	Suggested the concept of Smart voucher system.
Sang Yong Yoon (2012)	Korea's level of disability and welfare service is lowest in OECD. It is biased towards the medical model and the overall system regarding needs assessments is a major problem such as the limitation of registration system for the disabled, supply & demand criteria of each service, the lack of standardization and integrated service monitoring.	
Sang Yong Yoon	Although 95.1% of disabled persons were registered, the support awareness is low. (Supported	

(2015)	meanly_49%)	
Seok Soon Shim (2017)	It was found that the service was not provided to all of the service target, that it was difficult to receive the necessary services according to the time and place, the service decision right was not effectively guaranteed, the activity assistant lacked the expertise, and the family participation was not easy.	Proposed to achieve universality in selection of target person, to develop various services according to the type and characteristic, to provide 24-hour service, to strengthen self-control of service users through introduction of direct payment system and personal budget system.
Jung Youn Park (2017)	Illegal use of voucher system. → Issue, Payment, Deal	Suggested to Improve realistic treatment and to tighten mandatory regulations.

3. Research Model and Analysis

3.1 Research Model

This study examined the acceptance intention of potential users or ordinary people when for blockchain technology in welfare service for the disabled. The Technology Acceptance Model is a model developed to explain and predict the behavior of users who use information technology to understand why people accept or reject new information technologies. Venkatesh, Morris, Gordon Davis, and Fred Davis (2003) have examined technology acceptance based on several theoretical models that are rooted in information systems, psychology, and sociology. In this paper, we utilize the Unified Theory of Acceptance and Use of Technology (UTAUT), which emphasizes the necessity of presenting a model incorporating these theories. TAM2 has an explanatory power of 34% to 52%, while UTAUT has an explanatory power of 70% which is a practical limit. This study propose a research model based on UTAUT.

Security and economics were selected as the leading variables in consideration of the linkage with the public service sector among characteristics of blockchain technology. The sutdy selected willingness to pay for the use of public goods, fairness considering the problems of the welfare service for the disabled, and regulation of legal and institutional characteristics as service to be managed by the government as leading variables related to welfare service for the disabled. Considering that blockchain is not yet a mature technology, acceptance intention was selected as a dependent variable without adopting the facilitation condition and use behavior among variables. Table 5 shows operational definitions and previous studies for each variable used in this study model.

Table 5. Operational definition and literature review of variables

Variable	Operational definition	Literature review

Security	To believe that the Blockchain system is no risk of hacking or possibility of forgery. Also it helps to utilize personal information and protect privacy.	As a result of the study on the demand of the public delivery system using smart phone, the higher the concern about security, the more negative the recognition, usability and attitude(Jinwoo Park, 2011). High reliability and transparency in system are needed to request, access and identify in Web services environment(Sunghun Lee, 2013) As a result of study on the privacy paradox of personal information providing act, the monetary or personalization services by information disclosure act have positive effect. But the symptom of decreasing influence appeared after received protection training about personal information(Yeonjong Kim, Jinsung Kim, Byunghuk Ahn, 2016). As a result of analyzing the impact of purchase of smart TV with security enhancement, social influence was the most important factor(Sung-Phil Cho, Gi-Hyouk Lee, 2017). IoT(Internet of Things) network is vulnerable to physical security such as limited memory and power, and it is necessary to develop algorithm including message confirmation code and block encryption(Jungtae Kim, 2017)
Economic	To believe that economic efficiency will be increased by using Blockchain system such as reducing the operation, maintenance and working hours of the person concerned.	In adoption of Cloud Computing Service, the most influential factors are efficiency, economy and reliability in the order of named(Dong-ho Kim, Jung-hoon Lee, Yang-pyo Park, 2012). As a result of acceptance factor of public safety service using Internet of things, it is found that economic factor has the biggest influence on acceptance intention(Namjun Cha, 2015).
Willingness To Pay (WTP)	The Blockchain system (as public goods) is believed to be of value to bear the commission or some cost of use. WTP(Willingness To Pay) WTA(Willingness To Accept)	As a result of evaluating the economic value of the cognition enhancement program for old people as an approach to pay, the amount of WTP is more than twice as much as the ability to pay. Proposed the necessity to introduce and expand the program(Ji Young Lim, Mi Sook Song, Young Ran Han, Eun Joo Kim, Kyung Won Choi, Young Mi Sung, 2010). If there is a large gap between WTP and WTA, conflicts and social costs can arise. If there is a discrepancy, it is difficult to negotiate voluntarily in public works(Tae Eun Kim, 2017).
Fairness	Blockchain system is believed to reduce corruption and increase transparency and provide benefits correctly.	Government trust based on non-discriminatory distribution is important because it increases citizens' voluntary acceptance of policy(Hojung Son, Wonho Chae, 2005). It suggests that smartphone location based information can be processed fairly to enhance user 's information providing behavior(Jong Ki Kim, Sang Hee Kim, 2014). The variables that have the greatest effect on government trust is interaction fairness, and on government performance is distribution equity(Sangjoon Shin, SookJong Lee, 2016).

Regulation	The role of the government, such as legislation and policy, is important in introducing Blockchain technology into public services.	As a result of the study on the impact of openness outcome of public data by e-government, more policy efforts are needed to elicit active and leading participation of citizens(Joo Seong Hwang, 2015). One of the success factors in introducing Blockchain technology in Estonia is strong support by laws and regulations(Young Im Bae et al, 2018).
Performance Expectancy	The introduction of Blockchain technology will improve the performance of the organization, as well as the people involved.	IoT technology characteristics on SCM performance expectation and intention for Chinese logistics supply chain and distribution companies has a positive effect(Shang Meng,Yong Ho Shin,Chul Woo Lee, Jun Ho Mun, 2017). The paper of User Acceptance of information technology(Venkatesh et al, 2003).
Effort Expectancy	Using a Blockchain system does not require a lot of learning or knowledge. And it's not too complicated.	As a result of study on acceptance intention of the influence of banking service using smart phone China case, offering products with less effort increased acceptance intention(Soo Hyun Kim, Lei Li, 2012). The paper of User Acceptance of information technology(Venkatesh et al, 2003).
Social Influence	Acquaintances or surrounding people feel that using Blockchain technology is acceptable, or socially rational.	It is considered that the social influence has an effect on intention to use through the study of influential factor use of virtual cluster collaboration software(Kark Bum Lee, Ji Yeun Hwang, Sol Jung, 2013) The paper of User Acceptance of information technology(Venkatesh et al, 2003).
Behavioral Intention	The degree of commitment to the introduction and utilization of a Blockchain system.	According to UTAUT analysis result, it's confirmed that acceptance behavior of mobile credit card users has a significant influence on intention to use except effort expectation(Il Soon Park, Hyun Chul Ahn, 2012). As a result of study on the acceptance intention of new technology centered on Fin-Tech payment service using UTAUT, effort expectation, social influence and reliability have a significant effect(Seung ho Yang, Youn Sung Hwang, Jae ki Park, 2015)

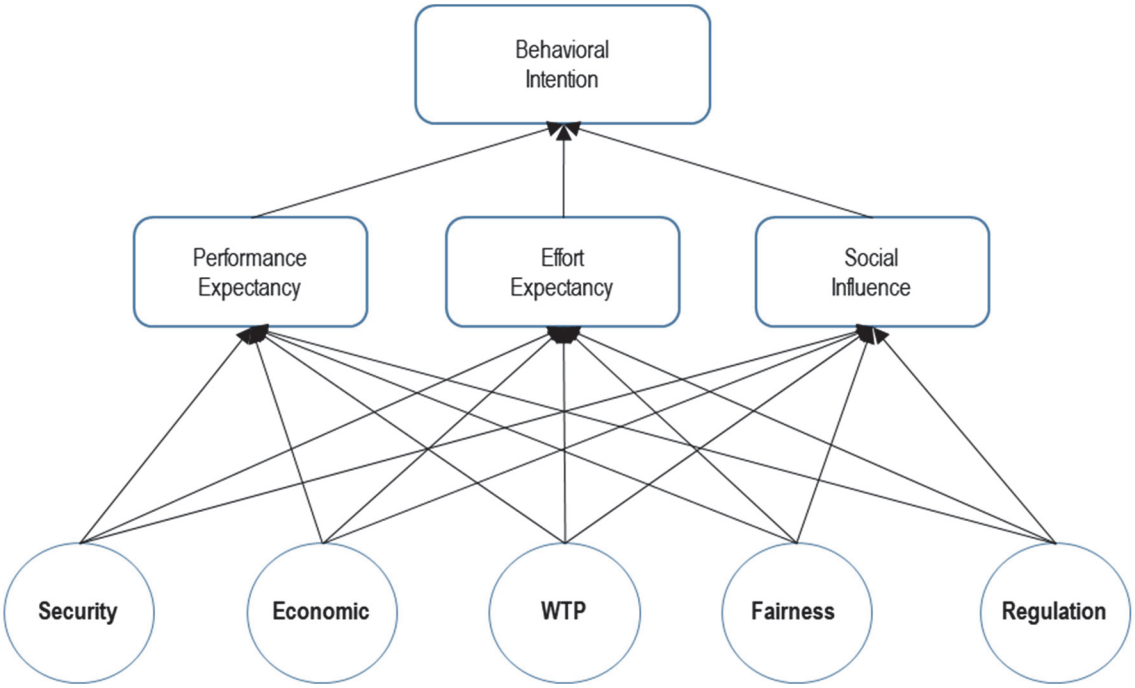

Figure 4. Study Model

3.2 Research Method

This study surveyed the general public based on operational definition of variables. It provided prior knowledge in the front of the questionnaire to help people understand unfamiliar blockchain techniques. As shown in Figure 5, the virtual process based on the rehabilitation center case using the voucher program in welfare service for persons with disabilities is explained. Real-time transactions involving government agencies, rehabilitation centers, and people with disabilities are available through multi-signature technology. Real-time identification technology is provided, but security is maximized. The remaining settlement techniques and distributed storage techniques can be implemented by applying the bitcoin process. Proof-of-work participants can be restricted to persons with disabilities, restricted to dispersed objects or government departments, and the process implementation method can be changed to a suitable structure.

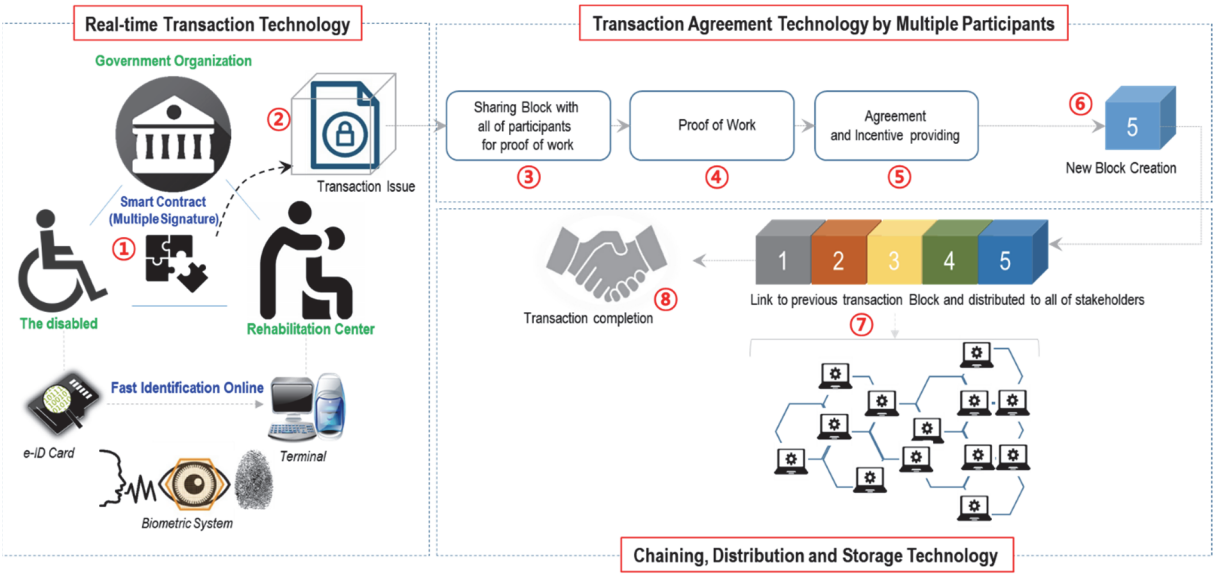

Figure 5. Virtual Voucher Process based on Blockchain (case of rehabilitation center)

Table 6 compares the present state of the welfare voucher program with changes introduced by the introduction of blockchain. In addition, it presents the shortcomings and disadvantages of the virtual process, which may result in a fee or other expense for the implementation of the blockchain-based system, and briefly describes the requirements for personal information. The questionnaire was structured so that the public understood the blockchain technique and participated in the survey.

Table 6. Comparison of change in Voucher Process for the disabled according to Blockchain introduction

	Classification	Before(current status)	After(change)	Remark
Behavior	Certification	Apply → Qualify → Notice	Automatic	If it meets certain condition, automatically gain and update the certification linking to hospital or organization concerned.
	Transaction	After payment of Personal expenses → Credit Card Issue → Use a Service → Request Cost → Payment for the cost	Real-time Transaction	The disabled, Service Center and Government organization join simultaneously(distribution agreement)
	Management	User management, Detailed statement of execution, payment verification, treasury disbursement are confirmed by several related departments and report periodically. High cost and inefficient information sharing.	Real-time transaction record is shared with related departments and persons concerned simultaneously, it's updated at the same level.	By transaction information is linked to previous blocks and stored as distribution way, the network can ensure security. No single point failure and possible high efficiency in cost management.
Concept	Identification	Identification Card, Welfare Card, Certification Card for the disabled and etc.	e-ID Card(Encryption)	Possible to protect privacy and improvement of security.
	Transaction	Need complicated procedure to corresponding to each department and take long time until transaction completion.	Within a couple of minutes	Require Infrastructure (e-ID Card, FIDO technology, Smart contract)
	Verification	Each of the related agencies performs unique roles sequentially.	Consensus and qualified by Multiple participants of the network.	Transparency improvement by distributed agreement.
	Management	Each of the related agencies stores the necessary transaction records only based on unique roles.	Share the same information with all of organization and persons concerned.	No Hacking. The solution of centralized network problem.

4. Empirical Results

4.1 Survey Progress and Demographic Characteristics

The survey was conducted from August 30, 2018 to September 30, 2018 for 32 days, and a total of 216 responses

were collected. Of the collected data, 200 valid data were collected and used for analysis. Demographic frequency analysis, factor analysis and reliability verification, and structural equation modeling (SEM) path analysis were conducted. The STATA / SE 12.0 program was used for statistical analysis. As shown in Table 7, males accounted for 62.5% of the total and males in their 40s to 50s accounted for 91.5%. The participation rate of the disabled was 14.0%, 3.5% of respondents and 31.0% of IT / information and communication workers.

Table 7. Demographic analysis of research data

Classification		**Frequency(number)**	**Ratio(%)**
Gender	Man	125	62.5
	Woman	75	37.5
Age	Below thirties	15	7.5
	More than forties and below fifties	183	91.5
	More than sixties	2	1.0
The disabled	The disabled[1]	28	14.0
	Non-disabled	172	86.0
Occupation	Related to the disabled[2]	7	3.5
	Etc.	193	96.5
Business Type	IT	62	31.0
	Etc.	138	69.0
Total		**200**	**100.0**

[1]A possessor of welfare card for the disabled or the aged and the immediate family of them

[2]Total 7 persons of respondents to the questionnaire engage in related occupation, 4 persons woks for medical or rehabilitation center, 3 persons for general company.

4.2 Factor Analysis

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to verify the validity of the data to be analyzed. Cronbach's alpha coefficient was used for the reliability of measured variables, and it was judged that there was no problem in reliability when the coefficient value was 0.7 or more (Kim, 2013). As shown in Table 8, this study obtained satisfactory reliability in terms of security, economic efficiency, payability, fairness, and regulated adult leading variables and performance expectation, effort expectation, and social influence UTAUT variables and dependent variables. As shown in Table 9 and Table 10, model fit and structural fit of the path analysis were $\chi 2$ / df = 2.116, RMSEA = 0.075, CFI = 0.832 and TLI = 0.820. The structural equation model was in agreement.

Table 9. Goodness-of-fit Test of SEM

		Goodness of Fit
Likelihood ratio	$\chi 2$_model vs. saturated(801)	1694.522
	p＞$\chi 2$	0.000
	$\chi 2$_baseline vs. saturated(861)	6188.084
	p＞$\chi 2$	0.000
Population error	RMSEA	0.075
	90% CI, lower bound	0.000
	Upper bound	.
	pclose	.probability RMSEA <=0.05
Information criteria	AIC(Akaike's information criterion)	15989.325
	BIC(Bayesian information criterion)	16464.283
Baseline comparison	CFI(Comparative fit index)	0.832
	TLI(Tucker-Lewis index)	0.820
Size of residuals	SRMR(Standardized root mean squared residual)	0.216
	CD(Coefficient of determination)	1.000

Table 10. Goodness-of-fit Test Result of SEM

	Fit Index	Fitness standard (Good)	Fitness standard(Acceptable)	Fitness Result
χ2/df	2.116	<2	<3	Acceptable
RMSEA	0.075	<0.08	<0.10	Good
SRMR	0.216	<0.05	<0.10	-
CFI	0.832	>0.90	>0.80	Acceptable
TLI	0.820	>0.90	>0.80	Acceptable

On path analysis, security only positively affects social impact (standardized path coefficient = 0.112, p-value = 0.028). This result is similar to the results of Pil & Lee(2017). Security in public services is basically required in a universal social system, such that people think that selecting a service with high security is warranted. Economic efficiency was measured by performance expectation (standardization path coefficient = 0.505, p-value = 0.000), effort expectation (standardization path coefficient = 0.464, p-value = 0.000), and social influence (standardization path coefficient = 0.145, p-value = And the effect of the positive (+)).

This is in line with the findings of Cha (2015). This study recognize that the efficiency of welfare services for people with disabilities is low, and blockchain technology has the potential to achieve maximum business performance with high efficiency. The effect of payout was positive only on social impact (standardized path coefficient = 0.21, p-value = 0.000). The benefits are expected to exceed the burden such as fees for use of public goods, and it can share some part of the rational system. Fairness was analyzed to have a positive effect on performance expectation (standardized path coefficient = 0.237, p-value = 0.001) and social impact (standardized path coefficient = 0.308, p-value = 0.000).

Table 8. Factor Analysis and Reliability Analysis

		Factor Loading	Cronbach's Alpha			Factor Loading	Cronbach's Alpha
Security	Security2	0.7971	0.8275	Performance Expectancy	P.E2	0.8489	0.9087
	Security1	0.7323			P.E3	0.8417	
	Security4	0.6917			P.E4	0.8225	
	Security5	0.6298			P.E1	0.7986	
	Security3	0.6121			P.E5	0.7547	
Economic	Economic2	0.7906	0.8382	Effort Expectancy	E.E2	0.8783	0.8867
	Economic1	0.7386			E.E4	0.8129	
	Economic5	0.6886			E.E1	0.7845	
	Economic4	0.6752			E.E3	0.7443	
	Economic3	0.6288		Social Influence	S.I3	0.9074	0.8927
WTP	WTP2	0.7924	0.8032		S.I2	0.8566	
	WTP1	0.7688			S.I4	0.8197	
	WTP5	0.7159			S.I1	0.6774	
	WTP3	0.6387		Behavioral Intention	B.I3	0.8493	0.8710
	WTP4	0.4609			B.I2	0.7481	
Fairness	Fairness4	0.8532	0.8768		B.I1	0.7402	
	Fairness3	0.8190			B.I4	0.7326	
	Fairness2	0.7997			B.I5	0.6957	
	Fairness1	0.6934					
Regulation	Regulation4	0.8148	0.8504				
	Regulation3	0.7970					
	Regulation1	0.7289					
	Regulation5	0.7181					
	Regulation2	0.6266					

This can be explained by the findings of Son et al. (2005) and Kim et al. (2014). If the service is provided without discrimination by general principles, it means that it can increase confidence in the government which can improve acceptance of the service. Regulatory performance was positively affected by performance expectation (standardized path coefficient = 0.155, p-value = 0.030) and social influence (standardized path coefficient = 0.220, p-value = 0.002). This is consistent with the importance of government policies and regulations, as reported by Seong (2015) and Bae & Lim (2018). In this study, the effect of standardized path coefficient (0.641) on acceptance intention was positive (p = 0.271, p-value = 0.001). This is the same as the results of Park et al. (2012) and Kim Jung-seok (2017). This means that even if some efforts are necessary to use the new service, the service can be introduced as needed. The results of the path analysis by variables are summarized in Table 11. Based on the path analysis, the research model can be expressed as shown in Figure 6. Payment and fairness have the greatest influence on acceptance intention, followed by economic and regulatory influence.

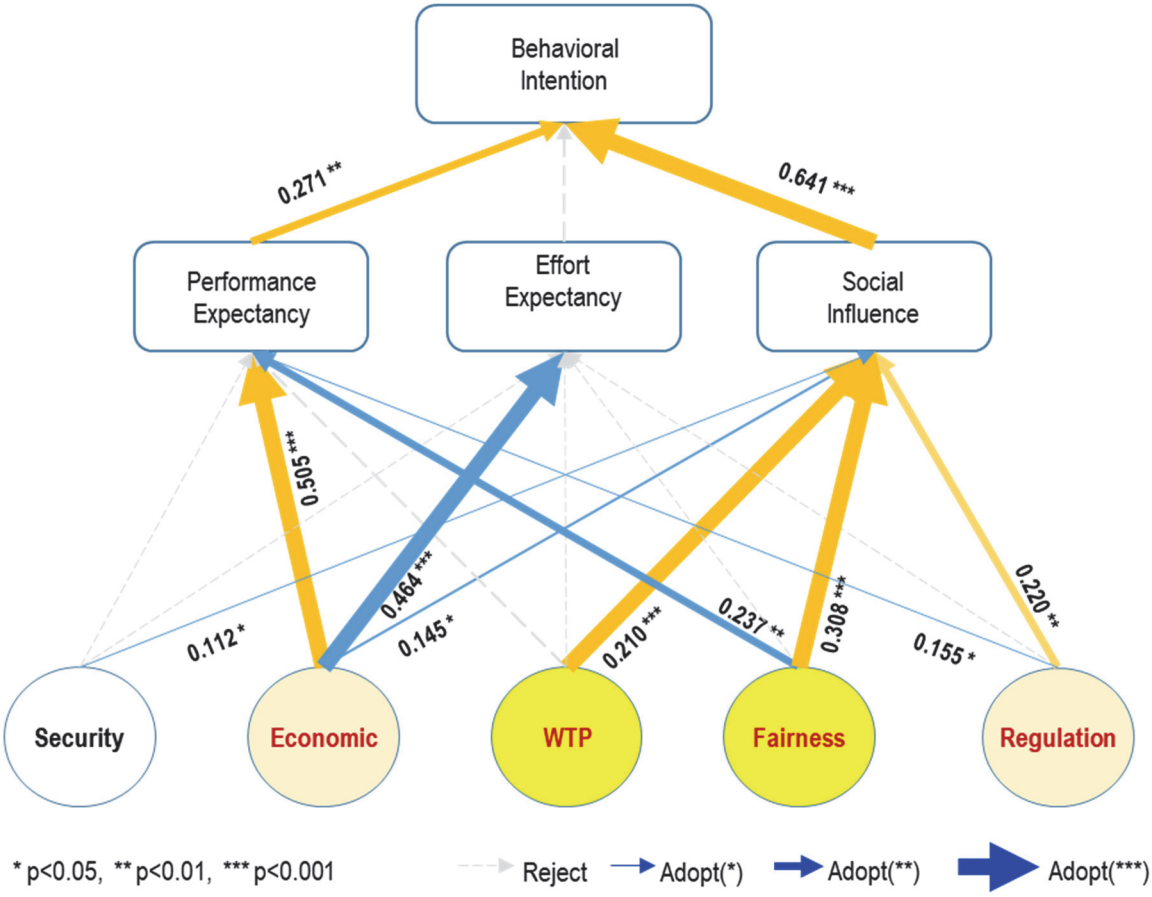

Figure 6. Analysis Result of Study Model

Table 11. Result of Path Analysis

Path	Standard Coefficient	Standard Error	p-value
Security → Performance Expectancy	0.029	0.052	0.577
Security → Effort Expectancy	0.155	0.100	0.123
Security → Social Influence	0.112	0.051	0.028
Economic → Performance Expectancy	0.505	0.076	0.000
Economic → Effort Expectancy	0.464	0.124	0.000
Economic → Social Influence	0.145	0.061	0.018
Willingness To Pay → Performance Expectancy	0.052	0.050	0.296
Willingness To Pay → Effort Expectancy	0.186	0.097	0.055
Willingness To Pay → Social Influence	0.210	0.053	0.000

Fairness → Performance Expectancy	0.237	0.071	0.001
Fairness → Effort Expectancy	0.180	0.129	0.165
Fairness → Social Influence	0.308	0.072	0.000
Regulation → Performance Expectancy	0.155	0.072	0.030
Regulation → Effort Expectancy	-0.079	0.135	0.557
Regulation → Social Influence	0.220	0.071	0.002
Performance Expectancy → Behavioral Intention	0.271	0.080	0.001
Effort Expectancy → Behavioral Intention	0.063	0.043	0.147
Social Influence → Behavioral Intention	0.641	0.099	0.000

5. Conclusion and Implications

5.1 Research Results and Implications

The purpose of this study was to investigate the acceptance of blockchain technology, which is presented as a solution to problems caused by the development of network technology (centralization of power, biased benefits, privacy, and single failure point) and the relevant factors for adoption. The results of the investigation are summarized below.

First, issues of economics, fairness, and regulations impact performance expectations. By decentralizing a centralized structure, there is a high expectation for a highly efficient and economical network environment by reducing time and cost and securing transparency by managing information distribution. It is highly anticipated that the platform be fair to people who need it at all times, such as voluntary operational trust protocol composed of network participants, and an identity card that can be encrypted and verified in real time. Proper regulation that does not hinder the development of technology and service is an important factor on performance expectation by guaranteeing convenience of service use and safety. On the other hand, security did not affect performance expectation. However, current technology may be a result of low awareness of privacy or the low possibility of high efficiency because of high security.

Second, only economic efficiency was found to affect the expectation of effort. This is because blockchain technology is in the early stages of adoption and there are not many actual application cases. In the field of cryptography, where blockchain technology is most widely used, a clear understanding of the service is not yet realized. In the private blockchain service, the public does not share the applied technology and structure. This can be interpreted as a reflection of the situation that requires considerable effort to adopt.

Third, it was confirmed that preceding variables including security, economics, paying, fairness, and regulations impact social influence. The value of a blockchain technology is in the potential to address current network structure problems, attract a large number of people, change the structure of asset allocation, realize a truly shared economy, and protect both privacy and public safety at the same time Expectations that can have a positive impact are reflected. The characteristics of public services tend to be more meaningful, and it can be explained that the expectation for blockchain technology is much greater in fields such as the welfare service for persons with disabilities.

Fourth, performance expectation and social influence were found to affect acceptance intention, and effort expectation did not affect acceptance intention. Both users and managers increase efficiency and convenience, and there is a sense of universal social order and expectation of fair service implementation. In the case of effort expectation, it can be said that in a situation where blockchain is not universal, some learning and knowledge are considered necessary for technology acceptance.

Fifth, fairness and payout among the leading variables have the greatest influence on acceptance intention, and economics and regulatory factors are the next influential factors. When introducing new technology into public welfare service for the disabled, it is important to establish fairness. The fact that the payment service is influential is proof that current service is inconvenient and the expectation for the new service is high. The burden of current expenses suggests the new service could be advantageous. In addition, when introducing blockchain technology to welfare service for the disabled, there is a need to secure economic efficiency through the improvement of efficiency (cost and business aspects) and supporting policies and institutional support.

Assuming that the virtual blockchain process using vocational rehabilitation center is introduced using the voucher system, which is provided as a prior knowledge of the questionnaire, the results of this study can be of help in establishing a practical strategy. Because it is intended to accept some degree of personal information utilization and costs (fees, terminals, etc.), which is seen as a disadvantage, the fee can be used to make the network sustainable without the involvement of a third party. In addition, if the secured identity assurance technology is used, it will be able to provide a part of personal information, and the burden of introducing the process can be minimized because the cost of constructing the process can be partially shared. In constructing processes, it is necessary to concentrate on the implementation of transparent and efficient systems so that fairness and economic efficiency will have a substantial effect, and the acceptance level is increased when the government adopts the structure that is supported by well-considered and balanced regulation.

The implications of this study are as follows. First, blockchain technology, which is expected to be 5 or 10 years from stabilization, is not limited to theoretical studies. As the technology is in early stages, academic research on blockchain is lacking. This study analyzed acceptance intention by an empirical method reflecting the characteristics of technology. Second, blockchain technology can be applied to various fields. This paper is meaningful as a precedent study on the introduction of blockchain technology in the field of welfare services for the disabled. In addition to the characteristics of blockchain technology, the research model is presented reflecting the problems of welfare service for the disabled and the characteristics of public services. In addition, this study suggests for establishing a practical strategy direction when examining the introduction of blockchain technology in the public service sector.

5.2 Research Limitations and Further Study

This study was conducted empirically on factors affecting acceptance intention for introducing blockchain technology to welfare services for persons with disabilities. It has several limitations. First, the use intention of blockchain technology has been verified in a situation where the technology is not recognized or understood at a stabilized or mature time. However, more practical analysis is needed through research on use behavior after technology diffusion. Second, the opinions of persons with disabilities or related persons are not reflected even though the study considers welfare service for the disabled. It is necessary to find more meaningful antecedent variables by approaching organizations and individuals, ensuring sufficient sampling, and interviewing to understand problems or improvements. Third, disability is a social problem. In today's dangerous society, anyone can suffer a severe handicap. In this respect, it is necessary to sample various age groups. The concentration of data into a specific age group in this study can be improved. Fourth, blockchain technology is in the initial introduction stage and research on welfare service for the disabled has been conducted at a time when research in various fields has not yet been completed. Further research after the technology has matured will be meaningful. Fifth, to construct the overall process of the welfare system for persons with disabilities, work should be carried out to identify and reflect various meaningful predecessors through research on technology introduction to other specific areas of the welfare system for persons with disabilities. Sixth, blockchain technology is not the only solution for solving the problems of welfare services for people with disabilities. It is necessary to study more effective network technologies than blockchain technology that improve the public interest by addressing the issues of blockchain technology.

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