Effect of Smart Attributes of SPA on Intention to Use of Blockchain System

- Based on Securities Lending of Small and Medium Construction

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Abstract

Background/Objectives: This study investigates the effects of Smart Attributes of SPA on the perceived usefulness and Intension to Use of blockchain systems. To achieve the purpose of the study, we analyzed the effect of Smart Attributes of SPA on Perceived Usefulness and Intension to Use of blockchain systems using TAM.

Methods/Statistical analysis: The data for this study were collected through a survey. We conducted a survey of users from June to August 2019. A Likert 5-point scale was used. The survey targeted Small and Medium Construction staff and using the Blockchain system. There were 719 valid cases. SPSS 24 and AMOS 22 were used for the analysis of collected data. The analysis methods were technical analysis, frequency analysis, correlation analysis, reliability analysis, factor analysis, CFA, Structural Equation Model.

Findings: The findings can be implied in three ways: First, when designing a blockchain-based securities lending system, the system should be designed according to the user's purpose, that is, the 'Usability' attribute should be included in the function. Second, 'Customization' should be considered when designing the system. In other words, the needs of specific customers should be fully understood and reflected in the system design. Third, when designing a system, the 'Connectivity' attribute must be fully considered. It is to be able to connect social and device-to-device networks and all the connectable objects.

Improvements/Applications: When designing a blockchain-based securities lending system, the four attributes of Smart Attributes of SPA should be fully reflected. In other words, if 'Usability', 'Customization', and 'Connectivity' are reflected as much as possible, it will contribute to the early settlement of the system.

Keywords: blockchain system, architecture, securities lending, TAM, smart attributes, SME

1. Introduction

This study is about securities securitization through securities lending of small and medium construction companies. In detail, this study analyzes the effect of smart characteristics of blockchain-based securities lending system on system acceptance intention. Architecture is the fundamental idea of any design (Ulrich, 1995). An architecture is a system of knowledge of the components that make up a system, the relationships between elements, and the rules that can be applied to those relationships (Lee and Hong, 2017). The use of architecture has been developed as part of the development of ICT and computer integrated production. Various architectural models have been developed for the establishment and operation of corporate modeling and management systems. According to Double Helix, firms change from a vertical-integrated industrial structure to a horizontal-modular industrial structure by making decisions about the product-supply chain (Fine, 2010). Fujimoto revised Fine's theory to design a three-dimensional model of the business architecture as a component of the three key areas of the business: product, production, and supply chain (Fujimoto, 2002). CIM-OSA (Computer Integrated Manufacturing Open System Architecture) is a cube model consisting of View Dimensions, Lifecycle Dimensions, and Generic Dimensions. This provided a balanced view of the system, enabling balanced planning and control (Beeckman, 1989). Purdue enterprise reference architecture (PERA) also emphasized systematic analysis and modeling of corporate activities (Williams, 1994). As such, the architecture has been utilized as a tool for comprehensive understanding and analysis of the system. Blockchain is a set of blocks connected in order to secure and maintain the safety and integrity of transactions. The software consists of algorithms using encryption and security technology, and is based on P2P system. The design of the service becomes even more important when integrating blockchain technology, which is the core technology of the 4th industry, with the securities lending, a traditional financial technique. The system should be designed to minimize the user's fear and anxiety when digitizing the existing financial transaction business with new IT technology that does not know the details. Therefore, it is very meaningful to analyze the effect of the architectural component, the blueprint of the system, on the acceptance of the system user. The purpose of this study is to examine the digitization of products and services in terms of architecture, and to analyze the effect of smart characteristics on the acceptance of blockchain system by applying TAM (Cao, 2019); (Ceesay and Fanneh, 2019); (Chukwu, 2019).

2. Materials and Methods

2.1 Background

2.1.1 Smart Attributes of SPA

There are many ways to implement a software system, but the system architecture must be determined. System architecture is a way of structuring components and establishing relationships between them. The role of the software architecture is to firstly define the structure of the system, secondly to properly reflect the user's requirements, and thirdly to provide a basic framework for the detailed design of future systems (Bass et al., 2003). The architecture has been used as a tool for comprehensive understanding and analysis of the system. The smart product / service architecture (SPA) is shown in Figure 1.

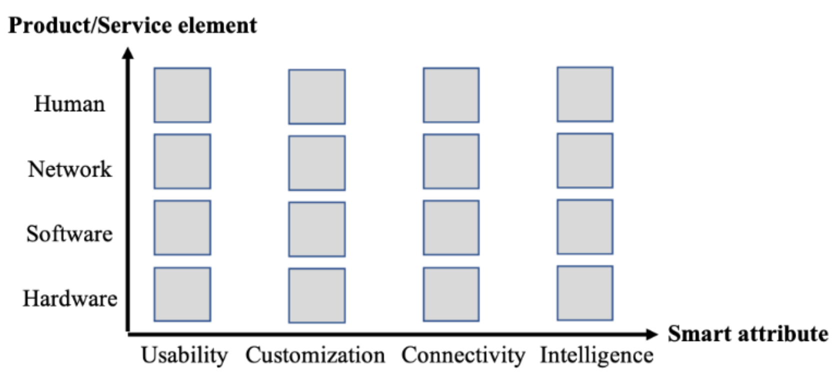

Figure 1. The smart product / service architecture

SPA has a modular structure that reflects recent trends. SPA takes the architectural perspective (Fujimoto, 2002) proposed by Fujimoto and divides smart products into two dimensions. SPA is an architecture for the inherent nature of smart transformation that occurs in a wide variety of products. Smart is defined as an attribute that can act autonomously based on closed loop control, energy efficiency and networking capabilities (Akhras, 2000). Smart systems aim to be a Cyber-Physical System (CPS) that combines OT (Operational Tech) and IT. SPA is also designed to monitor and control both worlds for optimization by interacting in real time between objects in the virtual and real worlds. Deloitte cited intelligence, connectivity, activeness, agility, and reliability as the characteristics of “smart” factories (Burke et al., 2017). SPA has set the characteristics of smart products and services to Usability, Customization, Connectivity, and Intelligence (Lee and Hong, 2017). The first smart feature is Usability. According to the definition of ISO, Usability is a function to effectively and efficiently achieve the user's purpose of use. The sub-properties are as follows: 1) it should have an intuitive interface. 2) It must have a situated interface. 3) Provide a seamless user experience with other devices (Lee and Hong, 2017; Jokela et al., 2003). The second smart property is Customization (Lee and Hong, 2017). Customization means creating products or providing services that reflect the needs of specific consumers (Pine et al., 2009). Customization can provide competitive benefits with increasing consumer value and better service (Simon and Dolan, 1998). In this study, three sub characteristics of customization are defined as follows. 1) This is a configurable property. This is to change the function and characteristics of the product according to the needs of users. 2) It is an extensible property. It is the function to extend the product function by adding or interlocking hardware or software. 3) It is a DIY-enabled nature. It is the property that user can participate in the process of changing the setting of the product and confirming the function (Lee and Hong, 2017; Simon and Dolan, 1998). The third smart feature is connectivity (Lee and Hong, 2017). The key to being smart is 'connectivity'. The three sub features of connectivity are: 1) it is social-networkable. Do you communicate or share information among individuals or groups who have unique purposes, such as social relationships, common interests, or increased efficiency? 2) Device-networkable: Do you provide extended services through communication and integration with other smart products? 3) Ubiquitous. Can I connect / access / edit the same information anytime, anywhere? (Lee and Hong, 2017; Fredette et al., 2012). The fourth smart feature is intelligence (Lee and Hong, 2017). Intelligence is a solution for predicting accurate consumption patterns of consumers. Intelligence is used to extract useful information from the big data collected during business processes (Mani and Chouk, 2017). In this way, the intelligence comes from the expert knowledge that can also be integrated in the analysis process, the knowledge-based methods used for analysis, and the new knowledge created and communicated by the analysis process (Mani and Chouk, 2017; Nauck et al., 2008). The sub characteristics of intelligence are as follows. 1) The ability to be context-aware.: Intelligence should have the ability to perceive the user's time, weather and location. 2) The ability to accumulate knowledge. Intelligence must have the ability to produce meaningful information by analyzing patterns through accumulated data. 3) The ability to be proactive: Intelligence must have the ability to know and treat users' intentions or actions in advance (Lee and Hong, 2017; Porter and Heppelmann, 2014).

2.1.2 Blockchain-Based Securities Lending

The development of blockchain technology is divided into three stages. Blockchain 1.0 is a time when innovations in existing financial systems, such as payments and remittances, have occurred with the emergence of Bitcoin. Blockchain 2.0 is a time when contract automation is centered around the 2nd generation blockchain, Ethereum's "Smart Contract." Blockchain 3.0 is a time when technology is spread and applied throughout society (Swan, 2015). In this study, the blockchain system was used for the recognition of ownership and transfer of unlisted securities of SME. Using this system will help financing small and medium sized construction companies. The block chain-based securities lending transaction structure is as follows (McJohn and McJohn, 2016). 1. Create a crypto stock wallet. 2. Create Hash and transaction information. 3. Generate key and address. 4. Signing and network transmission. 5. Participants' Approval. 6. POW (proof of work). Securities lending is a transaction in which the borrower returns the same or equivalent securities after a certain period of time when the owner of the securities (the securities lender) transfers the securities to the other party (the securities lender). As shown in Figure 2, borrowers securities borrowing securities to provide collateral to guarantee their performance. During the period of the loan, securities borrowers use the securities borrowed for lack of settlement in the trading transaction or for other financial transactions such as arbitrage and hedging. At the end of the securities lending period, the securities lender returns the collateral to the securities lender, and the securities lender pays the lending fees to the securities lender for the period corresponding to the lending period. Securities lenders can obtain profits through various financial transactions using loaned securities, and securities lenders can borrow their idle securities to obtain profits (rental fees) (Baklanova et al., 2015).

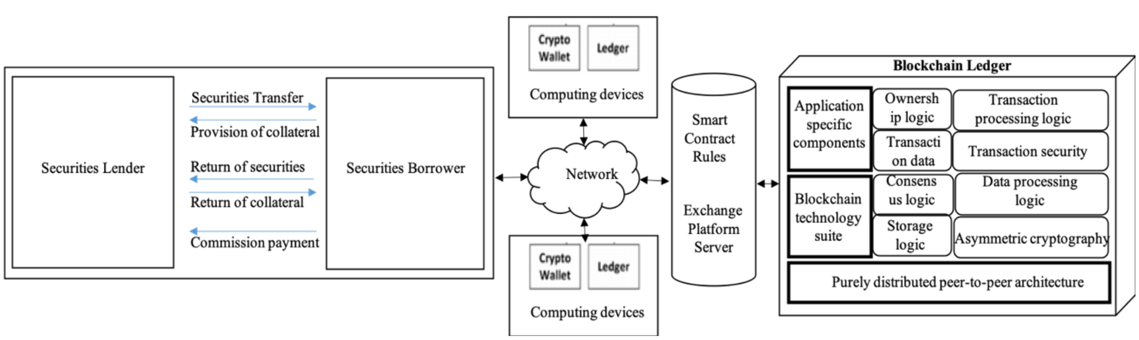

Figure 2. Blockchain-based securities lending

2.1.3 The Technology Acceptance Model

The Technology Acceptance Model (TAM) is a model that expands the relationship between attitudes and behavioral intentions of Rational Behavior Theory (TRA: Theory of Reasoned Action) into information technology acceptance research (Agarwal and Prasad, 1997). TAM is designed to predict the willingness of members to use information systems that are introduced at the organization level to improve performance (Davis et al., 1989). The TAM presented attitudes as key determinants of predicting the willingness of members to use IT systems. Determinants of attitude resulted in 'perceived usefulness' and 'perceived ease of use'. The perceived usefulness is the degree to which he believes that his work performance will be improved by using the blockchain system. Perceived usability is the degree to believing that using a blockchain system does not require much effort. The intention to use is to intend to use intelligent information technology or a product (or service) to which the technology is applied (Davis et al., 1989). TAM2 excluded attitudes from the model to accommodate the results of previous studies, maintain model simplicity, and increase explanatory power for use (Venkatesh et al., 2003). In this study, we adopted the TAM2 shown in Figure 3. However, the TAM ignored a variety of external factors that could affect the adoption of technology. There are also limitations in the application of complex technologies. In this study, Smart Attributes of SPA was used as an external variable to compensate for this limitation. We used Perceived usefulness as a Mediator and Intention to use as a dependent variable.

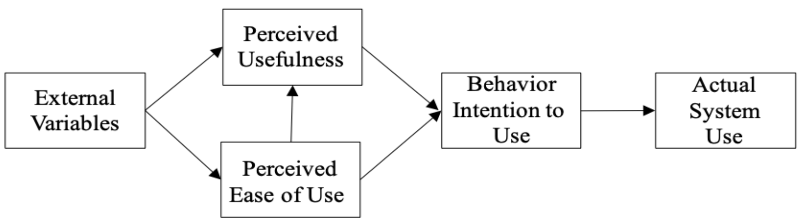

Figure 3. TAM2

2.2 Research Hypothesis

As a result of reviewing the preceding studies, the following hypotheses were derived.

H1. Usability, a Smart Attributes of SPA, will have a statistically significant effect on the perceived usefulness of blockchain systems.

H2. Customization, the Smart Attributes of SPA, will have a statistically significant effect on the perceived usefulness of blockchain systems.

H3. Connectivity, a Smart Attributes of SPA, will have a statistically significant impact on the perceived usefulness of blockchain systems.

H4. Intelligence, a Smart Attributes of SPA, will have a statistically significant impact on the intention to use of blockchain systems.

H5. Usability, a Smart Attributes of SPA, will have a statistically significant effect on the intention to use of blockchain systems.

H6. Customization, the Smart Attributes of SPA, will have a statistically significant effect on the intention to use of blockchain systems.

H7. Connectivity, a Smart Attributes of SPA, will have a statistically significant impact on the intention to use of blockchain systems.

H8. Intelligence, a Smart Attributes of SPA, will have a statistically significant impact on the intention to use of blockchain systems.

H9. Perceived usefulness will have a statistically significant effect on the intention to use of blockchain systems.

H10. Perceived usefulness will mediate the relationship between Usability, a Smart Attributes of SPA and Intention to use.

H11. Perceived usefulness will mediate the relationship between Customization, the Smart Attributes of SPA and Intention to use.

H12. Perceived usefulness will mediate the relationship between Connectivity, a Smart Attributes of SPA and Intention to use.

H13. Perceived usefulness will mediate the relationship between. Connectivity, a Smart Attributes of SPA and Intention to use.

2.3 Research Model

This study investigates the effects of Smart Attributes of SPA on the perceived usefulness and Intension to Use of blockchain systems. After reviewing previous studies, the characteristics and advantages and disadvantages of blockchain and Smart Attributes of SPA were examined. The concepts and components of TAM were examined (Comfort and Oluwakemi, 2019); (Duru and Anyanwu, 2019). This study is different from previous studies as follows. First, the combination of product architecture and TAM, which are indispensable elements for business system design. Second, the study of architecture for blockchain-based securities lending. The research model of this study is shown in Figure 4.

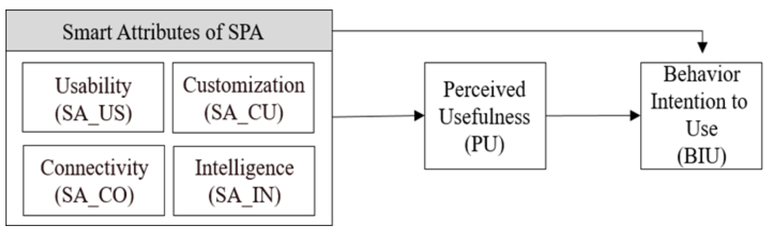

Figure 4. Research model

2.4 Operational Definition of Variables

Classification of Variables, Potential variable, Measurement variable and Calculation of measurement variables are the same as Table 1.

Table 1. Operational definition of variables

Classification	Potential variable	Definition of Measurement variable	Question	Previous research
Independent variable	Usability [SA_US]	Usability is a function to effectively and efficiently achieve the user's purpose of use	3	[2] [5 ~ 15]
	Customization [SA_CU]	Customization means creating products or providing services that reflect the needs of specific consumers	3	
	Connectivity [SA_CO]	connectivity are1) it is social-networkable, 2) Device-networkable, 3) Ubiquitous.	3	
	Intelligence [SA_IN]	Intelligence is a solution for predicting accurate consumption patterns of consumers.	3	
Dependent variable	Intention in use [BIU]	I am willing to use the blockchain system	4	[21,22]
		I'm in favor of introducing a blockchain system		
		I will recommend the blockchain system to others		
		I will use the blockchain system regardless of whether people around me use it		
Mediator	Perceived usefulness [PU]	Easier to handle task through blockchain system.	4	[21,22]
		Safer work process through blockchain system		
		Improves job performance through blockchain system		
		Products or services with intelligent information technology are useful to me.		

2.5 Data Collection and Statistical Analysis

The data for this study were collected through a survey. We conducted a survey of users from June to August 2019. The survey targeted Small and Medium Construction staff and KSCFCusing the Blockchain system. Likert 5-point scale was used. 900 copies of questionnaires were distributed and 720 copies were collected. The users of the proposed system were actually used. Statistical analysis was performed by using AMOS 22.0 and SPSS 24.0. The analysis methods were technical analysis, frequency analysis, correlation analysis, reliability analysis, factor analysis, CFA, Structural Equation Model.

3. Results and Discussion

3.1 Empirical Analysis

3.1.1 Characteristics of the Sample

The demographic characteristics of the samples are shown in Table 2. The surveyed company works for a small company, with 64.2%, the rest being medium sized companies. The working period of the survey subjects is 39.2% over 20 years, 60.8% under 10 years. The positions are section chief 6.0%, department head 22.2%, and site manager 22.6%. Others are 49.2%. The working department is 28.8% for Architectural, 37.2% for Civil Engineering, 30.0 for Administration. Others are 4.0%.

Table 2. Characteristics of the sample

Classification	Value label	Frequency (person)	Ratio (%)
Company size	Small-scale	462	64.2
	Medium-scale	258	35.8
Years of service	years<10	438	60.8
	Years>=20	282	39.2
Position	Section chief	43	6.0
	Department head	160	22.2
	Site manager	163	22.6
	Other	354	49.2
Department	Architectural	207	28.8
	Civil	268	37.2
	Administration	216	30.0
	Other	29	4.0

3.1.2 Descriptive Statistics

The results of descriptive statistics are shown in Table 3. Each variable was measured in 5 equal intervals. Since the absolute value of standard deviation and skewness is not larger than 3.0 and the absolute value of kurtosis is not more than 8.0. The data of this study showed skewness of 1.012 ~ 0.173 and kurtosis of 1.264 ~ 0.167, which satisfied the condition of normal distribution. As a result of reviewing the Z value of each variable, it is judged that there is no abnormal value because there is no case of ±3 or more.

Table 3. Characteristics of measurement variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
MEAN_SA_US	720	1.00	5.00	4.0727	.85448	-1.012	.091	.878	.182
MEAN_SA_CU	720	1.00	5.00	3.3383	.88697	-.373	.091	-.018	.182
MEAN_SA_CO	720	1.00	5.00	4.1205	.67432	-.758	.091	1.264	.182
MEAN_SA_IN	720	1.00	5.00	3.1094	.84349	-.173	.091	-.167	.182
MEAN_PU	720	1.00	5.00	3.7690	.73109	-.481	.091	.752	.182
MEAN_BIU	720	1.25	5.00	4.1528	.63967	-.747	.091	1.240	.182
Valid N	720								

3.1.3 EFA and Reliability Analysis

Exploratory factor analysis was conducted to confirm the validity of the data. Principal component analysis (eigenvalue 1.0 or higher): varimax (factorial value 0.4) were used. The commonality is the rate at which each variable is explained by the extracted factors, with a value between 0 and 1, with a baseline of 0.4. Table 4 shows that the KMO Measure of Sampling Adequacy is 0.912 and Bartlett's Test of Sphericity is 9554.896 (DF = 78, p <.001). Cumulative Total Variance Explained was 77.42%. The commonalities all exceeded 0.4. It was confirmed that the measured variables explained the potential variables well. The Cronbach'α value of each factor was found to be reliable from the range of 0.815 ~ 0.908.

Table 4. Exploratory factor analysis and reliability analysis

Variable	Factor	Rotated Component						Communalities	α
Usability	SA_US1	.846						.852	0.908
	SA_US2	.864						.882	
	SA_US3	.772						.814	
Customization	SA_CU1		.872					.869	0.898
	SA_CU2		.839					.865	
	SA_CU3		.768					.759	
Connectivity	SA_CO1			.672				.717	0.870
	SA_CO2			.867				.868	
	SA_CO3			.862				.863	
Intelligence	SA_IN1				.854			.816	0.815
	SA_IN2				.791			.807	
	SA_IN3				.722			.622	
Perceived usefulness	PU1					.722		.728	0.836
	PU2					.726		.733	
	PU3					.729		.697	
	PU4					.692		.618	
Intention in use	BIU1						.801	.760	0.882
	BIU2						.859	.822	
	BIU3						.719	.687	
	BIU4						.751	.705	
eigenvalue		3.105	2.680	2.582	2.490	2.340	2.288	-	-
Total Variance Explained **(%)**		15.524	13.400	12.909	12.449	11.702	11.442	-	-
KMO Measure of Sampling Adequacy: 0.912, Bartlett's Test: 9554.896 (df =190, p <0.001): cumulative variance: 77.42%									

3.1.4 Correlations

Correlation analysis was conducted to verify the association between variables. As a result, as shown in Table 5, there was a significant correlation between all variables (P <0.001). In detail, the correlation between MEAN_SA_IN and MEAN_SA_CU was the highest (r = .609): followed by the correlation between MEAN_PU and MEAN_SA_US (r = .600): followed by MEAN_PU and MEAN_SA_CO (r = .533).

Table 5. Correlations

Variable	Mean	SD	MEAN _SA_US	MEAN _SA_CU	MEAN _SA_CO	MEAN _SA_IN	MEAN _PU	MEAN _BIU
MEAN_SA_US	4.0727	.85448	1					
MEAN_SA_CU	3.3383	.88697	.338***	1				
MEAN_SA_CO	4.1205	.67432	.524***	.341***	1			
MEAN_SA_IN	3.1094	.84349	.319***	.609***	.339***	1		
MEAN_PU	3.7690	.73109	.600***	.450***	.533***	.430***	1	
MEAN_BIU	4.1528	.63967	.507***	.418***	.518***	.322***	.583***	1

*p<0.05, **P<0.01, *** P<0.001

3.1.5 Confirmatory Factor Analysis

A confirmatory factor analysis was conducted to confirm the convergent validity between the factor and the measurement variable. As shown in Table 6, the model fit was X^{2}/DF=534.175/155 (p<.001): CMIN/ DF = 3.446, RMR = .035, GFI = .930, AGFI = .905, NFI = .945, TLI = .951, CFI = .960 RMSEA=.058. Since all of the criteria were met, the measurement model was judged to be appropriate. Because factor loadings between each factor and each item were more than λ = .50, all the measured variables were found to be statistically significant (p <.001). Looking at the results of the analysis, 1) the **conceptual validity** is based on a standardization factor of 0.5 or more. Factor loadings between each latent and measured variable range from λ = 0.613 to 0.905. The conceptual validity of all items was found to be statistically significant (p <0.001). 2). the **convergent validity** is based on AVE above 0.5 and 0.7 above CR. As a result of analyzing convergent validity as shown in Table 6, AVE of all variables is 0.507 ~ 0.705, all exceeding the standard. In addition, CR was found to be between 0.920 and 0.952, indicating that convergent validity was statistically significant.

Table 6. Goodness of fit for measurement model

Path			Standardized coefficient	Non-standardized coefficients	S.E.	***t**(Sig)*	P	AVE	CR
Usability	→	SA_US1	0.863	1				0.682	0.948
	→	SA_US2	0.905	1.175	0.037	31.757	***		
	→	SA_US3	0.867	1.022	0.034	30.059	***		
Customization	→	SA_CU1	0.787	1				0.705	0.952
	→	SA_CU2	0.922	1.177	0.043	27.372	***		
	→	SA_CU3	0.888	1.122	0.042	26.714	***		
Connectivity	→	SA_CO1	0.889	1				0.679	0.942
	→	SA_CO2	0.886	0.945	0.032	29.531	***		
	→	SA_CO3	0.739	0.851	0.037	23.000	***		
Intelligence	→	SA_IN1	0.613	1				0.646	0.952
	→	SA_IN2	0.914	1.278	0.073	17.507	***		
	→	SA_IN3	0.822	1.243	0.073	17.027	***		
Perceived usefulness	→	PU1	0.655	1				0.507	0.920
	→	PU2	0.770	0.968	0.056	17.286	***		
	→	PU3	0.806	0.927	0.052	17.827	***		
	→	PU4	0.803	1.129	0.063	17.921	***		
Intention to Use	→	BIU1	0.771	1				0.602	0.951
	→	BIU2	0.780	1.095	0.047	21.426	***		
	→	BIU3	0.860	1.125	0.046	23.804	***		
	→	BIU4	0.824	1.007	0.049	22.959	***		
CMIN/DF=315.066/48 (p<0.001): RMR=0.035, GFI=0.930, AGFI=0.905, NFI=0.945, IFI=0.960, TLI=0.951, CFI=0.960, RMSEA=0.058									

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

3.1.6 Discriminant Validity

Discriminant validity is statistically significant when the AVE value is greater than the correlation coefficient squared. As a result of the analysis, as shown in Table 7, all variables exceeded the criteria, and the discriminant validity was judged to be statistically significant.

Table 7. Discriminant validity

Variable	Usability	Customization	Connectivity	Intelligence	Perceived usefulness	Intention to Use
Usability	**0.682**					
Customization	**0.140**	**0.705**				
Connectivity	**0.289**	0.141	**0.679**			
Intelligence	0.123	**0.457**	0.141	**0.646**		
Perceived usefulness	**0.469**	0.231	0.360	0.231	**0.507**	
Intention to Use	0.303	0.207	0.283	0.151	**0.444**	**0.602**

3.2 Hypothesis Testing

3.2.1 Structural Model Analysis

Structural model verification was performed to verify the hypothesis. The goodness-of-fit of the structural model, as shown in Table8, is CMIN / DF = 1,203.618 /161 (p <0.001): RMR = 0.085, GFI = 0.849, AGFI = 0.804, NFI = 0.879, IFI = 0.890, TLI =0.870, CFI = 0.890, RMSEA = 0.095. As shown in Figure 5, all the paths in the relationship between independent and dependent variables were statistically significant (p <.001). Hypotheses H1 ~ H7 and H9 were accepted as in Table 8. H8 was rejected.

Table 8. Goodness of fit for structural model and hypothesis testing result

Hypotheses	Path			Standardized coefficient	Non-standardized coefficients	S.E	t(CR)	P	Result
H1	SA_US	→	PU	0.530	0.449	0.035	12.977	***	Accept
H2	SA_CU	→	PU	0.166	0.141	0.031	4.593	***	Accept
H3	SA_CO	→	PU	0.322	0.303	0.035	8.536	***	Accept
H4	SA_IN	→	PU	0.176	0.177	0.038	4.665	***	Accept
H5	SA_US	→	BIU	0.149	0.113	0.036	3.126	**	Accept
H6	SA_CU	→	BIU	0.176	0.134	0.028	4.705	***	Accept
H7	SA_CO	→	BIU	0.179	0.150	0.034	4.365	***	Accept
H8	SA_IN	→	BIU	-0.011	-0.010	0.034	-0.292	0.77	reject
H9	PU	→	BIU	0.401	0.359	0.052	6.867	***	Accept
CMIN/DF=1,203.618/161 (p<0.001): RMR=0.085, GFI=0.849, AGFI=0.804, NFI=0.879, RFI=0.853, IFI=0.890, TLI=0.870, CFI=0.890, RMSEA=0.095									

*p<.05 **p<.01 ***p<.001

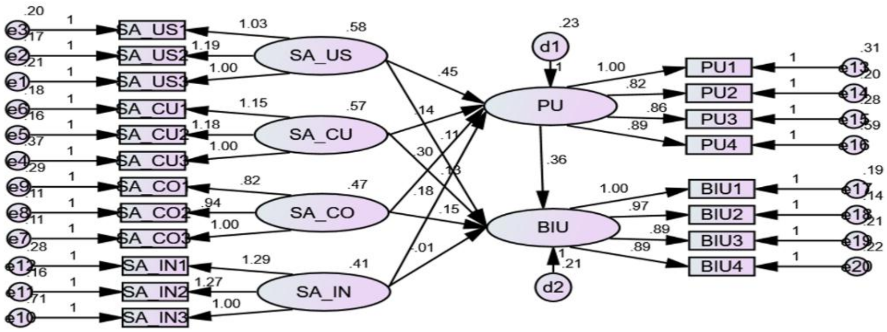

Figure 5. Path coefficients of structural models

3.2.2 Mediating Effect Analysis

We investigated whether Perceived usefulness mediates the relationship between Smart Attributes of SPA and Intention to use. A method of determining the indirect effect of a specific mediator includes 1) Sobel test and 2) Bootstrap using phantom variables. In this study, the bootstrapping method (BC) was used. This method verifies the mediating effect by the significance of the indirect effect. As shown in Table 9, 'Perceived usefulness' partially mediated Usability and 'intention to use'. (Path coefficient =0.161, Confidence interval= 0.117~-0.7, p <.001) and also 'perceived usefulness' partially mediated Customization and 'intention to use'. (Path coefficient =0.051, Confidence interval=0.028~ 0.086, p <.001). Connectivity and Intelligence were also partially mediated. The confidence intervals of the two mediators did not include zero. The results of the Sobel test were also found to be significant. H10 and H13 were accepted.

Table 9. Mediating effect and hypothesis testing result

Hypotheses	Path	Indirect Effect	Confidence interval	p – value		Result
				Sobel	Bootstrap	
H10	SA_US→PU→IU	0.161	0.117 ~ 0.238	***	0.008	Accept
H11	SA_CU→PU→IU	0.051	0.028 ~ 0.086	***	0.006	Accept
H12	SA_CO→PU→IU	0.108	0.083 ~ 0.162	***	0.004	Accept
H13	SA_IN→PU→IU	0.063	0.033 ~ 0.110	***	0.006	Accept

*p<.05 **p<.01 ***p<.001

3.3 Discussion

This study analyzes the impact of four attributes of Smart Attributes of SPA on Intention to Use and perceived usefulness of blockchain systems. The results show that four attributes of Smart Attributes of SPA have a statistically significant effect on perceived utility of blockchain-based securities lending system. The analysis hypothesis was dismissed because only 'Intelligence' among the four attributes of Smart Attributes of SPA was not statistically significant for 'Intention to Use'. The perceived usefulness of the blockchain-based securities lending system has a significant effect on 'intention to use'. Therefore, when designing a system, it is necessary to design the system so that the user's work purpose can be effectively and efficiently achieved. In addition, the needs of specific customers should be analyzed in detail and reflected in the work process and reflected in the system design. In addition, the social network and the connection between devices and the Ubiquitous networking system will be introduced into the design, and the successful introduction of the new system by designing the blockchain system will be made.

4. Conclusion

The purpose of this study is to analyze the effects of four attributes of Smart Attributes of SPA on perceived usefulness and system acceptance intention in designing blockchain-based securities lending system. As a result, all hypotheses were supported except for the effect of 'Intelligence' attribute on 'Intention to Use'. The implications of this study are as follows. First, when designing a blockchain-based securities lending system, the system should be designed according to the user's purpose, that is, the 'Usability' attribute should be included in the function. Second, 'Customization' should be considered when designing the system. In other words, the needs of specific customers should be fully understood and reflected in the system design. Third, when designing a system, the 'Connectivity' attribute must be fully considered. It is to be able to connect social and device-to-device networks and all the connectable objects. The limitation of the research is that it is difficult to generalize the research by limiting the subject to the construction industry. In the future, we hope to expand the survey and contribute to the generalization of the research results.

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