A STUDY ON THE INFLUENCE FACTORS OF CITIZENSHIP AND ATTACHMENT ON SMART CITY ACCEPTANCE INTENTION FOR SUSTAINABLE DEVELOPMENT : FOCUSING ON INNOVATION RESISTANCE MODEL

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ABSTRACT

This study utilizes the existing innovation resistance model to understand the acceptability of smart cities for sustainable development. As a citizen of the state, we derived citizenship, a personal characteristic of the degree of responsibility and public knowledge, as variables, and presented a research model by deriving attachments describing the relationship between people, places, and the environment. Based on this, we tried to establish an empirical study after establishing logic to identify it, and conducted the research overall by drawing a comprehensive conclusion. Survey items were used based on literature research and prior research for hypothetical verification.

Key words: Smart City, Sustainable Development, Citizenship, Attachment, Acceptance Intention, Innovation Resistance

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1. INTRODUCTION

Smart City is drawing attention as a countermeasure to solve various problems caused by urban problems caused by urbanization that is rapidly changing. In the last two decades or so, smart cities have been growing rapidly, and so far, discussions have been steadily taking place to set

and establish concepts and directions for them. Early smart cities were promoted with the goal of intelligence in cities by preemptively introducing IT and ICT technologies. However, it has recently been used as an expanded comprehensive definition of smart cities as a means of managing, creating, operating, and improving the quality of life for citizens while embracing differences in levels of economy, technology, culture, and society.

When evaluating smart city projects promoted in the city where they live, citizens will recognize smart city projects through the services they directly feel and evaluate them accordingly. This has become a very important issue in Smart City, where the success of the project can be determined by how citizens perceive and evaluate the services performed in Smart City. In other words, it is very important how citizens evaluate smart city services and how they accept them.

But despite all these things, Smart City still falls short of our expectations. Citizens' sense of smart city services, which have been recognized as U-City so far, was insufficient for the expansion of facilities to provide services, the lack of communication systems with interested parties, and the supply of top-down simple services. In other words, it is necessary to shift the interest of research to citizens who are smart city users, rather than finding the cause of smart city itself. This means that there may be innovation resistance that citizens feel about smart cities.

Smart City has various types of services in various fields throughout the city. Real services are not only directly available to all citizens, but also to some specific beneficiaries; services include data collected from citizens, devices, assets and processed or analyzed to monitor or manage services such as schools, libraries, hospitals and other communities. In addition, citizens' understanding of their attachment to the communities they live in is also a necessary part of the success of smart cities, whose level of attachment depends on individual social characteristics, such as social status, role, and scope of activity (Kasarda et al., 1974).

Therefore, in this study, we want to check the impact of citizenship and attachment on smart city acceptance for sustainable development, and we want to look at the impact of innovation resistance in smart city by focusing on user resistance to innovation that can be overlooked.

2. THEORETICAL BACKGROUND

2.1. Smart City

Interest in smart cities has spread since 2010. Countries and cities around the world are pushing for smart cities with policies. Global companies are also interested in spreading smart cities. Smart City is also an active policy term. Academic definitions of smart cities are also diverse, and the concepts of smart cities defined in major studies are shown in Table 1.

Table 1 Conceptual definition of the smart cities

Author	Conceptual definition
Giffinger et al. (2007)	A city that operates in a future-oriented manner in terms of all-round urban life based on citizenship and trust
Harrison et al. (2010)	A city that maximizes synergies obtained by linking various types of infrastructure based on information and communication technology
Washburn et al. (2009)	A city that utilizes state-of-the-art technology to improve public services while enhancing the sustainability of the environment and improving the efficiency of the public service delivery process
Marsal-Llacuna et al. (2014)	Cities that optimize infrastructure, provide public services more efficiently through public-private sector collaboration, and create innovative industries utilizing state-of-the-art technology

British Standards Institution (2015)	A city that uses smart devices to strengthen connectivity and collects and utilizes information on the resources held in the city in real time to address the policy needs of urban residents or the demand for public services
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The emphasis on the definitions of smart cities in the preceding studies cited above is different. What stands out in the definition of Giffinger et al. (2007) is that smart cities are oriented toward the future through innovation in various sectors. Harrison et al. (2010) focuses on the kind of 'synergy' effect of connecting deformed infrastructure. Washburne al. (2009) emphasizes that digital technology can increase the allocation of resources and the utility of urban residents or businesses in cities. Marsal-Liacuna et al. (2014) is relatively similar to the definition adopted in the non-complex studies in that it defines the creation of innovative business models in the public and private sectors for smart cities against the backdrop of resource allocation or infrastructure optimization. On the other hand, the British Standards Institution (2015) again focuses only on solving urban problems through the use of advanced technology.

2.2 Citizenship

At the national level, the level of citizenship in the country is an indicator of the level of development and advancement of civil society. The level of citizenship is also an indicator of the quality of life of the people in the country concerned.

Smart Cities intend to address urban problems by the introduction of collaborative governance by private sector participation. The establishment and operation of cooperative governance requires the participation of ordinary citizens. The so-called "deliberation process for smart governance" requires citizens, who are participating subjects, to have democratic capabilities and attitudes as well as institutional devices for participation. Citizenship is a concept that encompasses a sense of community, participation, tolerance, political efficacy, political trust, compliance, and service consciousness that can positively affect the outcome of participation and participation. Smart cities are innovative not only in terms of technology but also in terms of the introduction of cooperative governance. Citizenship will therefore influence acceptance and innovation resistance to smart cities as an innovative policy alternative.

Thus, in this study, all the sub-factors of citizenship defined in the preceding studies discussed the issue of locality and society. Since the main contents are about the degree of responsibility and public knowledge as a citizen of the country, we intend to conduct re-search focusing on regional and social issues used by Heber (2012), who summarized them from a comprehensive perspective.

2.3 Attachment

It is defined as a social friendship formed through community membership and bond, such as identity, which means emotional attachment to a particular place, and dependence, which means functional attachment to the individual's needs and goals (Raymond et al., 2010). Dependency is the same concept as place dependence claimed by Stokols and Shumaker (1981). It is also called function attachment and can be evaluated because a place is a good place to do a particular activity (Williams et al., 1989). Identity to the community is also called affective attachment, which is what the community values for emotional and symbolic reasons (Williams et al., 1989). It is the same as Proshansky et al. (1983) proposed concept of Place Belonging. The identity of a place or community is the dimension of the self that defines the personal identity of an individual in relation to the physical environment. Social friendship and network ties are relationships between people. Communities are a complex system of friendship, blood

ties and social relations rooted in family life and the process of continuing socialization, and communities are considered to be a continuing social networking system (Kasarda et al., 1974).

2.4 Acceptance Intention

The problematic acceptance target in this study is new technology. Accommodation of new technologies involves costs. Consequently, the condition for a particular technology to be successfully accepted by an acceptor is of interest to academic research.

Davis (1989)'s Technology Acceptance Model (TAM) pioneers theoretical factors that influence acceptance. In the context of the technology acceptance model, acceptance is defined as the intention to continue any action related to the technology (Davis et al., 1992). The technology acceptance model is known as a theory for explaining individual media choice and use behavior based on the Theory of Reasoned Action. Initially, the technology acceptance model was to explain the acceptance of organizational members to the new technology introduced by the organization. The technology acceptance model lists perceived usefulness and perceived ease of use as influences on the acceptor's attitude to the technology (Davis, 1989).

Subsequently, the technology acceptance model was developed and expanded to include the Motivational Model of Davis et al. (1992), the Innovative Diffusion Model (Rogers, 1985; Moore, 1991) and the Social Cognitive Theory (SCT), but this study utilizes Davis (1989).

2.5 Innovation Resistance Model

Innovation resistance model is a theory about why innovative technologies cannot be activated. Mainstream research on innovation focuses on the acceptance and diffusion of innovation. The innovation resistance model is also an attempt to understand the acceptance and spread of innovation. However, there is a difference in perspective in that it focuses on resistance to innovation that has been relatively marginalized in mainstream innovation research. Studies focusing on innovative diffusion factors are criticized for overlooking innovation resistance even though it is a real phenomenon. The theory of resistance to innovation focuses on influencing factors that cause innovation resistance in response to these criticisms.

The concept of resistance to innovation was pioneered by Sheth (1981). Sheth (1981) is pioneering in that he presented two psychological phenomena concerning innovation resistance. First, habit is friendly to existing practices or behaviors. Second, the perceived risks that innovation application entails are key conceptual factors in innovation resistance. Innovation resistance is defined as a barrier to overcome in the process of innovation acceptance or diffusion, rather than an opposite concept of innovation acceptance or diffusion (Ram et al., 1989). Prior empirical studies show that the greater the perceived relative advantage, the less innovation resistance tends to decrease. Conversely, the absence or deficiency of perceived relative benefits can lead to innovation resistance (Schiffman et al., 1991).

3. RESEARCH METHOD

3.1. Research Models and Hypotheses

In this study, the impact of citizenship and attachment on smart city acceptance intention for sustainable development was focused on innovation resistance model. In other words, we want to check citizens for statistically meaningful differences between citizenship, attachment, acceptance, and resistance to innovation and verify what statistical implications exist between each variable. Therefore, the following research models are presented:

Figure 1 Research model

Hypothesis H1: Attachment will affect innovation resistance.

Hypothesis H1-1: The dependence of attachment will affect innovation resistance.

Hypothesis H1-2: The identity of attachment will affect innovation resistance.

Hypothesis H1-3: The social friendship of attachment will affect innovation resistance.

Hypothesis H2: Attachment will affect acceptance.

Hypothesis H2-1: The dependence of attachment will affect acceptance.

Hypothesis H2-2: The identity of attachment will affect acceptance.

Hypothesis H2-3: The social friendship of attachment will affect acceptance.

Hypothesis H3: Citizenship will influence innovation resistance.

Hypothesis H4: Citizenship will affect acceptance.

Hypothesis H5: Innovation resistance will affect acceptance.

Hypothesis H6: There will be a significant mediating effect on innovation resistance.

4. RESULTS ANALYSIS RESULTS

4.1 Validity and Reliability Verification

Verification of the reliability and validity of the measurement tool must be preceded in order to demonstrate the validity of the hypothesis's verification results in this work. Therefore, exploratory factor analysis was conducted using SPSS 22.0K to verify this by dividing it into convergence validity, which means intrinsic consistency between items, and discriminant validity, which means independence between dimensions within the evaluation dimensions of measurement variables. The factor extraction method used the principal component extraction method, and the factor rotation method performed Varimax rotation, one of the orthogonal transitions, and excluded items loaded on other factors or with a factor load of less than 0.4 during factor analysis. Factor analysis is most commonly used as a common method of analysis to assess whether actual measurements of metrics are consistent with the theoretical concepts originally intended. Extracting factors from factor analysis typically includes methods by principal component and methods by common factor analysis, which we investigate using principal component analysis.

In general, factor extraction extracts factors with an Eigen value of 1.0 or higher based on the eigen-value, which is the amount of variance the factor can account for. A value of 1.0 means that the variance of one variable is abbreviated. Factor loading is considered statistically significant when above 0.40 and is represented by a varimax method to eliminate the correlation between factors.

Verifiable factor analysis was carried out through the steps of verifying the concentration feasibility of each measurement variable, the concentration feasibility of the latent variable, and the discriminant feasibility. Following the exploratory factor analysis, the confirmatory factor analysis was divided into exogenous and endogenous variables to assess feasibility, using the measurement model of AMOS 21.0. Verifiable factor analysis is a method of factor analysis that contrasts with exploratory factor analysis, in which re-searchers know in advance about the theoretical structure hidden inside the data, so they use it to verify this theoretical structure. This is widely used because reliability verification assumes intrinsic consistency but fails to verify. The p values of GFI, AGFI, RMR, NFI, χ^2 , and p value of χ^2 were used to assess their suitability.

Reliability is the variance of measurements that appear when repeatedly measured for the same concept. In this work, reliability is measured using the Cronbach's Alpha co-efficient to measure intrinsic consistency. Nunnally (1978) argues that alpha values above 0.60 should be sufficient in the field of exploratory research, 0.80 in the field of basic re-search, and 0.90 in the field of applied research where important decisions are required. Van et al. (1980) also generalizes that the reliability of the measurement tool is not significant if the commonly required alpha value is 0.60 or higher at the analytical level of the organizational unit.

4.2 Exploratory Factor Analysis

Six factor analyses of economic, environmental, socio-cultural, citizenship, innovation resistance, and acceptance, which are the characteristics of this research model, were extracted. According to the table, the Eigen value was 1.998 to 4.265, all of which were above 1.0, clearly classifying all independent variables were clearly classified. The cumulative variance was 82.869% and the factor matching was greater than 0.4 to verify both the concentration validity and discriminant validity of the same factor between the measurement variables. Also, the KMO figure is .919, Bartlett's sphericity test validation shows that the chi-square value is 9237.959(df=231, p=.000). It was identified as 000).

The results of the detailed analysis showed that socio-cultural value consisted of five related surveys, with eigen-value of 4.265 and explanatory variance of 19.388%, indicating that socio-cultural value factors were selected. In terms of economic value, one economic value was found to be included in other factors, so it was deleted, and a total of four related questions were made up after deletion. The eigen-value was 3.925, and the explanatory variance was 17.842%. The analysis of environmental values consisted of four related questions, with an eigen-value of 3.188 and an explanatory variance of 14.490%, which was selected as an environmental value factor. In the analysis of innovation resistance, one question of innovation resistance was incorporated into another factor and deleted, with the eigen-value of 2.432 and the explanatory variance of 11.057%. In citizenship, one item of citizenship was included in other factors and deleted, and after deletion, the eigen-value was 2.423, and the explanatory variance was 11.012%, which was selected as a citizenship factor and studied. In the acceptance intention, one question of acceptance was included in other factors and deleted, and the eigen-value was 1.998 and the explanation variance was 9.081%, and this study was conducted after naming it as acceptance factor.

4.3 Confirmatory Factor Analysis

Prior to analyzing the structural equation model for the entire causal model, the discriminant validity and convergence validity of the measurement variables were confirmed to some extent through exploratory factor analysis. Additionally, confirmatory factor analysis of the preceding factors was performed using AMOS 21.0 for checking and statistical verification of the single dimensionality of each factor for the measurement items.

Confirmatory factor analysis of the characteristics of the preceding factors results in $\chi^2=459.613$, $df=190$, p value of χ^2 , goodness of fit index=0.907, adjusted goodness of fit index=0.876, comparative fit index=0.971, root mean square residual=0.052, normed fit index=0.951, root mean square error or approximation=0.059. The confirmatory factor analysis shows that if the magnitude of the critical ratio for structural model estimation is interpreted as a criterion of 1.96 or higher, the model in this study significantly exceeds 1.96 for each measurement variable and is significant at the significance level $p<0.001$. Therefore, it is judged that there is a reason to concentrate. Therefore, in this study, hypothesis verification is possible based on the collected data.

4.4 Discriminant Validity

The discriminant validity analysis of the selected variables in this study was conducted, and the resulting discriminant validity can be analyzed using AVE (Average Variance Extracted) and correlation coefficient values between concepts. If the square value of the correlation coefficient between the constructive concepts does not exceed AVE, it has discriminant validity (Fornell et al., 1981). In other words, if both mean variance extracts are greater than the square of the correlation between the two by comparing each AVE subject to a discriminant validity assessment and the square of the correlation between them, then there is a discriminant validity between them.

Variance extraction is the amount of randomness captured by the concept of composition in relation to the amount of randomness caused by the measurement error. The AVE was calculated by Fornell and Laker (1981) proposed formula, which is generally accepted as having a concentrated validity of >0.5 , meaning that one-half of the variance of the items must be accounted for by construction to accommodate them. Additionally, Anderson and Gerbing (1988) judged that a conceptual reliability of 0.7 or higher would have a good concentration validity, with most of the factors used in this study showing a conceptual reliability of 0.7 or higher. Since the square value of the correlation coefficient between the configuration concepts has not been shown to exceed AVE, the discriminant validity between the configuration concepts has been obtained.

In this study, correlation analysis was first conducted to see how the relationship is and how much it is related to each other for each unit of study scale that has been proven to be single-dimensional. Correlation analysis was conducted to determine the correlation between independent variables, and it was shown that most correlations exist. In addition, the value of the discriminant coefficient is 0.5 or higher, indicating that there is no abnormality in the discriminant validity.

4.5 Analysis of Hypotheses

The model of this study consists of six critical variables: dependence, identity, social friendship, citizenship, innovation resistance, and smart city acceptance. Factors derived from exploratory factor analysis in the research model have been validated for factor variables through confirmative factor analysis.

Figure 2 is a covariance structural equation model based on a research model, excluding variables removed from reliability and feasibility analysis.

Figure 2 Analysis Results of Research model

The results of the overall model verification presented in the research model are as follows. $\chi^2=459.613$, $df=190$, p value of $\chi^2=0.000$, goodness of fit index=0.907, adjusted goodness of fit index=0.876, comparative fit index=0.971, root mean square residual=0.052, normed fit index=0.951, tucker-lewis index=0.964, Parsimonius CFI=0.798, Parsimonius NFI=0.782, RMSEA=0.059.

To verify concept validity, we apply GFI (goodness of fit index above 0.9; good above 0.8), AGFI (adjusted GFI above 0.9), χ^2 (good for less desirable), and p value of χ^2 (good for more than 0.05) as evaluation indicators. The results show that among the overall good-ness-of-fit indices, GFI exceeds the baseline of 0.90, AGFI, a modified GFI considering degrees of freedom, exceeds the baseline of 0.90, and both CFI and RMSEA values exceed the baseline. Consequently, the goodness-of-fit indices generally show that this model is acceptable.

In other words, the results of the verification of the final study model are shown in Figure 2, and the results of the structural equation can be shown in Table 2.

Table 2 Results of Research Model Structural Equation Analysis

Hypothesis			Estimate	S.E.	C.R.	P	Adopted	
H1-1	Dependence	→	Innovation resistance	-.222	.035	-6.353	***	Adopted
H1-2	Identity	→	Innovation resistance	-.338	.070	-4.853	***	Adopted
H1-3	Social friendship	→	Innovation resistance	-.155	.079	-1.967	.049*	Adopted
H2-1	Dependence	→	Acceptance	.121	.023	5.250	***	Adopted
H2-2	Identity	→	Acceptance	.177	.045	3.955	***	Adopted
H2-3	Social friendship	→	Acceptance	.223	.050	4.420	***	Adopted
H3	Citizenship	→	Innovation resistance	-.207	.064	-3.246	.001**	Adopted
H4	Citizenship	→	Acceptance	.021	.039	.549	.583	Rejected
H5	Innovation resistance	→	Acceptance	-.221	.040	-5.467	***	Adopted

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

4.6 Indirect Effects Verification

Table 3 is the result of verifying indirect effects using Bootstrapping to verify the in-dependent variables of this study: dependence, identity, social friendship, and citizenship on the dependent variables, acceptance. The analysis found that dependence, identity, and social friendship had statistically significant indirect effects on acceptance intentions.

Table 3 Analysis Results of Indirect Effects

Dependent Variables	Dependence	Identity	Social friendship	Citizenship
Acceptance				
Coefficient value	.100	.093	.034	.069
P	.002**	.002**	.074	.008**

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

4.7 Study hypothesis Validation Results

In this work, validation was conducted based on the research model for the six hypotheses established. Furthermore, the independent variables dependence, identity, social friendship, and citizenship have been verified for indirect effects on the dependent variables acceptance intention, and the results of the overall hypothesis analysis are shown in Table 4.

Table 4 Results Table of Hypothesis Analysis

Hypothesis	Content of hypothesis	Adopted
H1	Attachment will affect innovation resistance.	Adopted
H1-1	The dependence of attachment will affect innovation resistance.	Adopted
H1-2	The identity of attachment will affect innovation resistance.	Adopted
H1-3	The social friendship of attachment will affect innovation resistance.	Adopted
H2	Attachment will affect acceptance.	Adopted
H2-1	The dependence of attachment will affect acceptance.	Adopted
H2-2	The identity of attachment will affect acceptance.	Adopted
H2-3	The social friendship of attachment will affect acceptance.	Adopted
H3	Citizenship will influence innovation resistance.	Adopted
H4	Citizenship will affect acceptance.	Rejected
H5	Innovation resistance will affect acceptance.	Adopted
H6	There will be a significant mediating effect on innovation resistance.	Partial adoption
H6-1	There will be an indirect effect of dependence on acceptance.	Adopted
H6-2	There will be an indirect effect of identity on acceptance.	Adopted
H6-3	There will be an indirect effect of social friendship on acceptance.	Rejected
H6-4	There will be an indirect effect of civic awareness on acceptance.	Adopted

5. CONCLUSION

This study aims to provide implications for a diversified approach to smart city business for the sustainable development of the country in the current era when new technologies such as the Fourth Industrial Revolution are emerging. However, simply technology is not enough to build a smart city. Smart cities do not unilaterally provide services through the construction of urban infrastructure. Smart City's biggest goal is to foster and participate in the city's citizenship as members. Therefore, the most important thing in smart cities is the awareness of citizens who want to use the service. No matter how high-tech a city uses, it is useless if it fails to provide benefits or convenience to its citizens. That is why citizen-centered smart cities should be emphasized.

The key point of smart cities is to interact with citizens as they use smart technology and become constantly familiar with it. Sustainable smart cities cannot be implemented without citizen participation. This is why both directions with citizens are important when implementing smart cities, not the authorities' arbitrary operation. Sustainable models will be created when both directions are implemented smoothly. Looking at various examples of implementing smart cities, they listen to citizens' opinions and reflect them in the project together. It is to lead the

project jointly, not simply to deal with civil complaints. Looking at the case abroad, Amsterdam in the Netherlands operates what is called the Smart Citizen Kit. Various experiments are being attempted by encouraging the city to distribute kits to citizens and to play a role in data collection, and by running various projects involving citizens. When these experimental projects affect satisfaction, they are adopted as formal programs and applied in real life. Citizens' satisfaction and utilization will be enhanced, making the city where they live and live a smart city.

So far, smart city prior studies have limitations that cannot deviate from the frame-work of simple acceptance centered on valuation of services from a customer's personal point of view by utilizing the acceptance theory associated with existing smart city services and information systems. However, recognizing the need for citizens to make efforts to embrace smart cities, research was conducted with the need to utilize the theory of resistance to innovation that accepts new innovations without resisting them. Therefore, in this work, we aim to define beneficiaries who embrace smart city services for sustainable development as citizens beyond the perspective of simple customers and explore research models on how their citizenship represents value awareness for smart cities and intentions to embrace and spread them.

For this study, 450 copies of the questionnaire were distributed to South Korean citizens, and the statistical processing of the retrieved questionnaire was followed by the da-ta coding process and then the SPSS 22.0 Korean version program and Amos 21.0. Verification of the hypothesis confirmed that most hypotheses were adopted. In detail, we could see that dependence, identity, and social friendship have a statistically significant negative influence on innovation resistance. In other words, it can be understood that the more dependence, identity, and social friendship increase, the less resistance to innovation. And in the influence of dependence, identity, and social friendship on acceptance intentions, the C.R. values were all found to be above the baseline, giving statistically significant static (+). These results can be interpreted as the higher the dependence, identity, and social friendship of smart cities, the greater the acceptance. Citizenship has had a statistically significant negative (-) influence on innovation resistance, and it has been confirmed that innovation resistance has a negative (-) effect on acceptance. These results mean that innovation resistance decreases as citizenship increases, and that higher innovation resistance increases acceptance.

In the existing research, we wanted to study the influences of simply observing the acceptance of smart cities from the perspective of individual customers who will use practical services, focusing on the technology acceptance model and value-based acceptance theory. However, to break away from this, this study was conducted using innovative resistance theory from the perspective of citizens as a whole who will benefit from smart cities, not from a simple personal perspective. Therefore, this study has important practical implications not only for academic but also for national institutions and related organizations that implement smart city projects.

On the other hand, the empirical survey of this study was conducted only once as a cross-sectional study at this time. It may be pointed out that longitudinal research is needed to secure further objectivity in the study, as differences in the degree of recognition of investigators may occur over time. To this end, future research can be an important indicator of citizens' intention to accept smart cities if surveys are repeatedly measured in various situations with time to spare. Despite the above limitations, this study expects to influence the performance of successful smart city construction by analyzing the impact on citizens' smart city acceptance intention for sustainable development based on innovation resistance theory.

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