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Optimizing Business Opportunities: The Evolving Landscape of Smart Cities in South Korea

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Abstract

Purpose: The purpose of this study is to investigate the essential factors contributing to the growth and success of smart cities, providing a comprehensive analysis of key elements that are crucial in fostering the development of smart cities. This study explored the impacts of technology-driven applications, corporate involvement, the role of experts, citizen co-creation, city-led strategy governance, and sustainable urban practices on overall attitudes towards smart cities. Additionally, the study examined the impact of overall attitude on the growth trajectory of the smart cities and satisfaction. **Research design, data and methodology:** To collect data, this study employed an online survey conducted by a reputable research organization. Data analysis involved the use of factor analysis, ANOVA, and regression analysis. **Results:** This study unveiled significant impacts of technology-driven applications, corporate involvement, the role of experts, citizen co-creation, city-led strategy governance, and sustainable urban practices on the overall attitudes. Furthermore, it demonstrated that the overall attitude significantly influences the growth trajectory of smart cities. **Conclusions:** This study identified key driving factors for smart city development, suggesting that the consideration of sustainable urban practices emerges as the most significant factor influencing the growth of the smart cities.

Keywords: Smart City, Sustainable Urban Practices, Overall Attitude, Growth Trajectory.

JEL Classification Code: M30, M20, M10, M15

1. Introduction

Choi (2020) underscored that the smart city is a multifaceted concept, implying the interaction of all elements within the urban environment and the integration of innovative technologies. Silva et al. (2018) highlighted that the continual growth of population and urbanization has spurred the exploration of innovative approaches to manage urbanization with minimal impact on the environment, citizen lifestyles, and governance. Lim et al. (2023) emphasized that the primary objectives of smart cities are to deliver advantages such as economic prosperity, environmental sustainability, and a high quality of life to their citizens.

Manfreda et al. (2021) underscored that smart cities hinge on the deployment of information and communication technology, catalyzing the digital transformation of our habitats that extends its influence across various domains, encompassing transportation, energy, governance, the environment, and the lives of citizens. Wolniak et al. (2023) highlighted the advantages enjoyed by citizens in a smart city, emphasizing the benefits

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of advanced transportation systems that facilitate seamless mobility, including intelligent traffic management and diverse public transportation options. In smart cities, these technological advances exert a potent and transformative influence on urban life, concurrently enhancing citizens' access to information and reinforcing knowledge as a pivotal driver of economic growth (Angelidou, 2016).

Xu et al. (2021) highlighted the importance of identifying critical success factors for smart cities to elucidate which determinants play a more critical role in their development and summarized key factors, encompassing the availability of expertise and technology, the efficiency of data management systems, the infrastructure framework supporting smart city development, environmental sustainability, and effective governance. Vanolo (2014) underscored that a vision for sustainable environmental concerns, along with the involvement and collaboration of communities, residents, associations, and public and private organizations, are pivotal factors in the development of smart cities. Smart cities have, to a large extent, achieved their objectives without significant public or citizen involvement and without ensuring the satisfaction of end-user customers (Choi et al., 2020). Effective communication with citizens is increasingly crucial for the development of smart cities that aim to improve the urban environment and quality of life, with Information and Communication Technology (ICT) holding the potential to enhance public participation (Granier & Kudo, 2016). Similarly, Simonofski et al. (2017) anticipated that the objectives of a smart city cannot be achieved without citizen involvement in its development process.

Based on the consideration, the purpose of this study is to explore the significant factors that drive the growth and success of smart cities and provide a comprehensive analysis of key elements that are crucial in fostering the development of smart cities. This study investigated impacts of technology-driven applications, corporate participation, the role of experts, citizen co-creation, city-led strategic governance, sustainable urban practices on overall attitudes towards the smart city, and the impact of overall attitude on the growth trajectory of the smart cities. This study formulated the following research questions: i) Do technology-driven applications impact overall attitudes towards the smart city? ii) Does corporate participation influence overall attitudes towards the smart city? iii) Does the role of experts affect overall attitudes towards the smart city? iv) Does citizen co-creation shape overall attitudes towards the smart city? v) Does city-led strategic governance influence overall attitudes towards the smart city? iii) Do sustainable urban practices impact overall attitudes towards the smart city? and iii) Does overall attitude influence the growth trajectory of smart cities?

2. Literature Review

2.1. Development of Smart City

Kozlowski and Suwar (2021) have defined a smart city as one that integrates information and communication technologies with social infrastructure, including human and social capital, as well as public institutions. This integration aims to enhance economic, social, environmental, and cultural development (Kozlowski & Suwar, 2021). Kim (2018) examined that the concept of the smart city was initially established in the mid-1990s in the U.S., referred to as digital cities. Hajek et al. (2022) highlighted the initial phase of smart cities, denoted as ‘Smart City 1.0,’ driven by technology companies, showing cases of smart city technologies and actively advocating for their adoption to city officials. Hajek et al. (2022) further noted that the succeeding phase, labeled ‘Smart City 2.0,’ took a distinct approach, where cities were driven more by a visionary concept of an ideal smart city, incorporating specific requirements tailored to the city’s needs, challenges, and priorities involved close coordination with technology providers to align technological solutions with the urban context. McQuire (2023) asserted that Smart City 1.0 represents the inaugural vendor-led, tech-centric paradigm, Smart City 2.0, on the other hand, is characterized as technology-enabled but ‘city led,’ focusing on more targeted and localized smart city programs. The evolution continues with Smart City 3.0, signifying an era marked by citizen co-creation (McQuire, 2023). Yigitcanlar et al. (2019) presented novel interpretations of the smart city concept, offering insights into potential directions for a more comprehensive reconceptualization aiming to steer towards a better understanding of smart cities, with the ultimate goal of avoiding a potential urban ecocide. Kinelski (2022) emphasized that Smart City 4.0 should take into account the intricate network of interconnections, which can yield tangible benefits through a concerted effort towards sustainable development. Svitek and Kozhevnikov (2023) delved into the emerging concept of ‘Smart City 5.0,’ building upon the foundation of the earlier Smart City 4.0 model by addressing implementation of an urban digital ecosystem, wherein each constituent element is represented by a smart agent operating on its behalf.

In this context, the emphasis on stakeholders' engagement, demonstrated in cities like Barcelona, Amsterdam and New York, is deemed crucial for developing morally balanced and socially aware smart city strategies, so such engagement provides valuable insights into the city's assets and needs, enhances public acceptance of smart city initiatives, and elevates urban smartness to a new level (Angelidou, 2014).

The case of Barcelona is particularly noteworthy, given its evident aspiration, as reflected in its current urban policies, to establish itself as a leading metropolis in Europe (Bakici et al., 2013). The city exemplifies collaboration as a cornerstone of its smart city initiative, with each partner operating independently while aligning their activities with the goals of the overall venture (Lee et al., 2012). Rose et al. (2022) analyzed the Amsterdam smart city ecology by applying the institutional dynamics that shape civil society involvement. New York City, adopting a localized approach, implemented a carefully crafted digital strategy tailored to local resources, priorities, and needs (Angelidou, 2014). Shah et al. (2019) examined smart city infrastructure through a case study of New York and explored the technologies and projects implemented in New York City, encompassing waste management, air quality control, water management, park management, and the integration of smart public transport.

2.2. Smart Cities in South Korea

Shin (2009) highlighted that the Ubiquitous City (U-City) initiative in South Korea constitutes a national urban development project specifically designed to reinforce the influence of information and communication technologies in civic planning and management. Furthermore, Shin (2009) emphasized that U-City involves the analysis of data transformations and their impact on public, political, and social discourse and discussed the prospectus of a ubiquitous computing in shaping the future of cities. However, Nam (2019) pointed out that the U-City concept in South Korea fell short in incorporating not only ideas and opinions but also the wants, needs, and desires of citizens because this shortfall was attributed to the fact that the vision for U-City did not originate from the citizens themselves. Jang et al. (2015) suggested the imperative need for resolving regional quality disparities among U-Cities and establishing a foundational framework to advance the realization of U-Cities with a higher degree of completeness. Yigitcanlar and Lee (2014) explored the integration of the Korean U-City concept with an eco-city perspective, resulting in the emergence of a new city type, the u-eco-city by adopting a comprehensive approach, integrating various technologies, policy areas, concepts, and visions to advance the information and communication technologies, sustainable urban planning, and civic empowerment.

Choi et al. (2020) pointed out that in 2005, a word connection network emerged, centering around the dual axes of “Daejeon,” one of the prominent high-technology cities in South Korea, and the overarching concept of “City.” Additionally, Choi et al. (2020) noted that the development for Sejong entails a comprehensive solution, encompassing aspects such as transportation, stability, urban management, and energy. Jeon (2021) reported that Songdo city in South Korea gained a global recognition as a smart city, built from the ground up in the early 2000s. Songdo smart city is recognized for successfully fulfilling its role in substantiating the smart city as a viable technological solution for urbanization in the 21st century (Kuecker & Hartley, 2020). Despite commencing in 2009, the construction of Songdo Smart City has experienced slow progress compared to the original plan that can be attributed to challenges such as budgetary constraints, insufficient state support, bureaucratic hurdles, regulatory issues, stakeholder resistance, and a failure to attract foreign capital investment (Shwayri, 2013). Leem et al. (2019) emphasized Sejong City as a strategic adopter of ICT-driven smart city initiatives. Its development prioritizes key elements such as transportation and public safety services, smart community design derived from citizens’ needs and a zero-energy community strategy for environmental sustainability (Leem et al., 2019). Despite being designated as a national pilot city smart development, Sejong City faces challenges, particularly the low citizens’ perception of various services and limited participation in fostering an innovative sustainable smart city, Cho and Oh (2019) emphasize the policy imperative to revitalize a smart research park, akin to Makerversity in Amsterdam, the DOLL Institute in Copenhagen, and Science Park in Singapore which enable citizens, companies, and stakeholders to collaboratively plan, experiment, and operate the city in a more innovative manner, fostering the sharing of ideas based on open data.

3. Hypotheses Development

3.1. Impacts of Technology-Driven Applications on Overall Attitude

The development of a smart city involves seamlessly integrating technology and data-driven solutions to enhance residents’ quality of life, improve efficiency, and effectively address urban challenges. Choi (2020) explored the concept of a smart city, defining it as an intricate ecosystem encompassing a variety of technological and socio-economic processes. Smart cities, guided by the intelligent city concept, primarily emphasize the interaction between urban space and technologies encompassing the capacity to foster innovation, transition to e-governance, facilitate social learning, and provide a robust ICT infrastructure (Vanolo, 2014). Graham and Marvin (2002) argued that the recognition of ICT solutions facilitating urban growth and restructuring was swiftly acknowledged by numerous large multinational companies, significantly contributing to the creation and dissemination of the smart

city discourse. Cities with low internet penetration among households or inadequate access to digital infrastructure face substantial limitations in smart city development (Praharaj, 2017). Therefore, the provision of user-centered ICT technology support is crucial to facilitate easy participation for more citizens, forming the foundation for smart city development. Ullah et al. (2020) emphasized the pivotal role of ICT in the smart cities concept, particularly in policy design, decision-making, implementation, and the delivery of ultimate productive services. Building upon these considerations, the present study hypothesizes that technology-driven applications influences overall attitudes toward the smart city.

H1: Technology-driven applications have a significant impact on the overall attitude towards smart cities.

3.2. Impacts of Corporate Participation on Overall Attitude

Kim (2018) addressed the necessity of various smart city projects with different scopes and functions and highlighted the importance of accumulating experiences from domestic companies in the establishment of smart cities and their competitiveness. Previous literature suggest that smart cities are characterized by a distinct emphasis on business-led urban development and the attraction of capital, striving to establish business-friendly environments that offer advanced services to businesses and entrepreneurs (Angelidou, 2016). Jiang et al. (2023) investigated that smart city construction significantly improves enterprise performance and the improvements are significant across all industries and regions. This study underscores the significance of diverse corporate involvement in shaping smart cities through contribution to technological innovation, market revitalization, and the creation of robust industrial ecosystem. Building upon these considerations, the present study hypothesizes that corporate participation influences overall attitudes toward the smart city.

H2: Corporate participation has a significant impact on the overall attitude towards smart cities.

3.3. Impacts of The Role of Experts on Overall Attitude

Kozlowski and Suwar (2021) addressed that one of definitions that link the city includes technology orientation involving the use of technological infrastructure, information communication technology to improve the quality of life in the city. Winkowska et al. (2019) emphasized the role of technology in defining smart cities, particularly highlighting smart technology as a cluster encompassing advanced technologies used in urban settings. Smart cities attract a highly qualified and skilled labor force due to their openness and enthusiasm for leveraging technology in effective and innovative ways (Angelidou, 2016). Furthermore, it is widely documented that creative, intelligent, and highly skilled individuals constitute the most potent catalysts for urban development (Edvinsson, 2006). They generate new ideas, products, and strategies, either individually or collaboratively within social networks (Komninos, 2009). Zhu et al. (2022) emphasized the significance of scholars and experts with robust knowledge of local smart city initiatives in formulating strategic measures for achieving happiness-driven smart city objectives. Building upon these considerations, the present study hypothesizes that the role of experts influences overall attitudes toward the smart city.

H3: The role of experts has a significant impact on the overall attitude towards smart cities.

3.4. Impacts of Citizen Co-Creation on Overall Attitude

Various studies have addressed the importance of citizen co-creation for the driving factors of the growth of smart cities. McQuire (2023) noted that Smart City 3.0 is characterized by a focus on an era marked by citizen co-creation. Choi et al. (2020) investigated that the evolution of smart city services began with the vision of processing from merely providing information to intelligent urban services based on integrated control services and aimed to offer interactive services with citizen participation. Simonofski et al. (2019) identified the method of citizen participation including citizen as democratic participants, citizens as cocreators, and citizens as information and communication technology users. Nastjuk et al. (2022) discussed the City 5.0 paradigm as a novel citizen-centric design concept for future cities, conceptualizing it as markets connecting providers of various public goods and services with citizens as consumers of these services. Kusumastuti and Rouli (2021) provided insights into the smart city implication and citizen engagement and addressed the importance to improve citizens' quality of life by managing city assets and resources effectively and efficiently. Citizen participation is crucial in inclusive policymaking as it serves as a strategy enabling non-stakeholder groups to actively engage in sharing information, shaping goals and policies, and contributing to decisions on how to allocate tax resources (Konsti-Laakso & Rantala, 2018). The living lab aligns with an innovative shift in urban planning emphasizing citizen participation, which serves as an apt tool for citizen involvement in urban planning, embodying a concept of user-centered, open innovation ecosystems grounded in a systematic user co-creation approach within public–private–people partnerships (Choo et al., 2023). This study posits that

citizens can engage in community by providing opinions for the development of smart city. Building upon these considerations, the present study hypothesizes that the citizen co-creation influences overall attitudes toward the smart city.

H4: Citizen co-creation has a significant impact on the overall attitude towards smart cities.

3.5. Impacts of City-Led Strategic Governance on Overall Attitude

Kim (2018) investigated that the South Korean government should primarily concentrate on developing successful models of domestic smart cities to establish valuable policy insights. Choi (2020) emphasized that the government's approach is geared towards enhancing urban infrastructure and empowering citizens to shape the role of the new technologies in their lives. The government's capacity plays a crucial role in addressing challenges such as budget shortages, implementing technological infrastructure, and organizing stakeholders, including citizens, which have been identified as significant shortcomings in smart city development (Tan & Taeihagh, 2020). Gasco-Hernandez et al. (2022) asserted that the city government's role in implementing the city governance methodology was crucial for smart city development, emphasizing the establishment of public-private partnerships, particularly with major companies, which enhanced collaboration between the city and industry and gave rise to new financial models. Wang et al. (2015) highlighted that the management capacity of local government plays a mediating role in the impact of financial investment on the implementation of green economic strategies. Building upon these considerations, the present study hypothesizes that the city-led strategic governance influences overall attitudes toward the smart city.

H5: City-led strategic governance has a significant impact on the overall attitude towards smart cities.

3.6. Impacts of Sustainable Urban Practices on Overall Attitude

This study posits that the integration of environmental considerations and a focus on sustainability are pivotal factors for the advancement of smart cities. According to Yang and Lee (2023), Sejong, serving as a pilot smart city, aspires to establish a sustainable platform city and transform everyday lives through the implementation of innovative services. Yigitcanlar and Lee (2014) pointed out that Korea has consistently formulated national strategies for sustainable urban development, employing various information communication technology-based approaches. According to Ullah et al. (2020), a smart city strives to enhance the economic well-being of citizens and empower them to efficiently utilize modern ICT, with a particular emphasis on sustaining a green environment amidst increasing urbanization and energy consumption. Amsterdam, exemplifying many European cities, has implemented the 2040 Smart City Strategy, actively pursuing an energy plan encompassing the reduction of greenhouse gases, the expansion of renewable energy, and the enhancement of energy efficiency, envisioning the transformation into an eco-friendly city (Manville et al., 2014). This study posits that smart cities can contribute the sustainable environment by applying eco-friendly energy, smart waste management system, and other green management policies. Building upon these considerations, the present study hypothesizes that the implementation of sustainable urban practices influences overall attitudes toward the smart city.

H6: Sustainable urban practices have a significant impact on the overall attitude towards smart cities.

3.7. Impacts of Overall Attitude on the Growth Trajectory of Smart Cities & Satisfaction

Ajzen (1989) explored that *an attitude is an individual's predisposition to respond favorably or unfavorably to an object, person, institution, or event, or to any other discernible aspect of the individual's world* (p.241). Ajzen (1989) also emphasized that attitudes are function of beliefs and can be inferred from responses to various kinds of belief statements. Ajzen and Cote (2008) addressed that *attitudes involve the evaluation of a particular psychological object, such as a physical entity, an institution, a person, group, policy, an abstract concept, or any other discriminable aspect of an individual's wor*ld (p.291). According to the theory of planned behavior (Ajzen & Cote, 2008; p.301), *attitude toward the behavior, subjective norm, and perception of behavioral control lead to the formation of a behavioral intention*. Altmann (2008) addressed that the three characteristics of attitudes, as analyzed in various definitions, encompass a mental state (conscious or unconscious), a value, belief, or feeling, and a predisposition to behavior or action. Oliver (1980) emphasized that consumer satisfaction is a function of expectation and expectancy disconfirmation, influencing attitude change and purchase intention. Cho (2023) conducted research on the various factors that influence the overall attitude toward the city. Lim et al. (2023) asserted that, within the social dimension, the quality of life is guaged by satisfaction with the urban environment, urban services, and life in general. Džunić et al. (2022) investigated perceived satisfaction with the quality of urban life by comparing cities in different European regions. Zhu et al. (2022) pointed out the insufficient research on how

smart cities impact human happiness and proposed a happiness-driven smart city mechanism grounded in a set of strategic measures. Building upon these considerations, the present study hypothesizes that overall attitude influences the growth trajectory of smart cities and satisfaction with smart cities.

H7: Overall attitude has a significant impact on the growth trajectory of smart cities.

H8: Overall attitude has a significant impact on the satisfaction with smart cities.

4. Methodology

This study conducted an online survey in collaboration with a reputable survey agency. This study administered an online survey in October 2023. The survey commenced with introductory questions gauging participant awareness, followed by inquiries about key variables under consideration and concluding with demographic information. The variables explored in this study encompass technology-driven applications, corporate involvement, the role of experts, citizen co-creation, city-led strategy governance, sustainable urban practices, overall attitudes towards the smart city, and the growth trajectory of the smart cities. This study formulated a set of 33 questions to assess the key variables. The response rate was approximately 15%. Furthermore, this study examines the anticipated impact of overall attitudes toward smart cities on various aspects, including technology-driven applications, corporate participation, the role of experts, citizen co-creation, city-led strategic governance, sustainable urban practices, the overall attitude, and influence on the growth of the smart cities. The research employs 5-point Likert scales for assessing major proposed items, ranging from 1 (strongly disagree) to 5 (strongly agree). The data for this study were collected from five prominent smart cities in South Korea encompassing Seoul, Incheon, Busan, and Daejeon and the national pilot smart city, Sejong. This study collected a total of three hundred and ten valid responses. The survey employed stratified sampling, considering factors such as residential area, age, gender, and other relevant demographics. The survey begins by evaluating citizens' awareness of smart city. This study utilized factor analysis, ANOVA, and multiple regression analysis to examine the proposed hypotheses. Reliability was assessed by examining Cronbach's alpha. The Cronbach's alpha results are summarized as follows: 0.744 for technology-driven applications, 0.853 for corporate involvement, 0.804 for the role of expert, 0.880 for citizen co-creation, 0.812 for city-led strategy governance, 0.800 for sustainable urban practices, 0.792 for overall attitudes towards the smart city, and 0.826 for the growth trajectory of the smart cities.

Table 1: Demographics of Respondents

		Respondents # (%)
Gender	Male	155 (50.0)
	Female	155 (50.0)
Age	20-24 years old	28 (9.0)
	25-29 years old	40 (12.9)
	30-34 years old	40 (12.9)
	35-39 years old	38 (12.3)
	40-44 years old	26 (8.4)
	45-49 years old	32 (10.3)
	50-54 years old	34 (11.0)
	55-59 years old	26 (8.4)
	60-64 years old	26 9 (8.4)
	Elder than 65 years old	20 (6.5)
Education	Middle School	2 (0.6)
	High School	71 (22.9)
	In College	33 (10.6)
	Bachelor's Degree	170 (54.8)
	Graduate Degree	34 (10.9)
Annual Income	Below 10,000,000 KRW	85 (27.4)
	Between 10,000,000-20,000,000 KRW	12 (3.9)
	Between 20,000,000-30,000,000 KRW	43 (13.9)
	Between 30,000,000-40,000,000 KRW	59 (19.0)
	Between 40,000,000 -50,000,000 KRW	43 (13.9)
	Between 50,000,000-60,000,000 KRW	19 (6.1)
	Between 60,000,000-70,000,000 KRW	16 (5.2)
	More than 70,000,000 KRW	33 (10.6)
	Other	68
	TOTAL	310

5. Data Analysis

In this study, factor analysis was employed and scale items were extracted using principal component analysis. The extraction method involved maximum iterations for convergence, and factors with eigenvalues greater than 1 were retained. VARIMAX with Kaiser Normalization served as the rotation method, with maximum iterations for convergence. Table 2 provides a concise presentation of the component matrix, inclusive of factor loadings. In this study, the questionnaire items applied as follows: i) for the technology-driven application aspect, the questionnaire items in this study inquire about the application of

information and communication technology including AI, Internet of Things, in advancing smart city development by enhancing public services; ii) for corporate participation, the questionnaire items in this study focus on exploring ways to enhance corporate involvement in advancing smart city development and boosting the competitiveness of the smart city ; iii) for the role of experts, the questionnaire items in this study delve into how opinions from experts in diverse fields contribute to the advancement of smart city development, aid in decision-making, and address social problems; iv) for citizen co-creation, questionnaire items in this study examine how input from citizen groups aids decision-making, contributes to the advancement of smart city development, and addresses social issues; v) for city-led strategic governance, the questionnaire items in this study explore the significance of local government support in smart city development decisions, focusing on how it enhances public service operations and addresses social problems; and vi) for sustainable urban practices, the questionnaire items in this study investigate how a smart city can contribute to a sustainable environment, explore citizens' preferences for a smart city that addresses environmental issues stemming from climate change, and evaluates their opinions on policies related to the eco-friendly initiatives.

Table 2: Component Matrix for Technology-driven Applications, Corporate Participation, Role of Experts, Citizen Co-creation, City-led Strategic Governance, and Sustainable Urban Practices

	Component					
	1	2	3	4	5	6
TA4	.78					
TA1	.78					
TA2	.77					
TA3	.67					
CP3		.84				
CP4		.83				
CP1		.82				
CP2		.80				
RE3			.83			
RE1			.82			
RE4			.77			
RE2			.74			
CC1				.82		
CC2				.82		
CC4				.81		
CC3				.80		
CS4					.83	
CS1					.81	
CS3					.79	
CS2					.70	
SU3						.83
SU4						.80
SU2						.78
SU1						.75

* TA: Technology-driven Applications; CP: Corporate Participation; RE: Role of Experts; CC: Citizen Co-creation; CS: City-led Strategic Governance; SU: Sustainable Urban Practices

Table 3: Component Matrix for Overall Attitude and Growth of Smart Cities

	Component	
	1	2
ATT	.86	
ATT	.83	
ATT	.80	
ATT	.76	
GRW		.87
GRW		.84
GRW		.89
GRW		.70

* ATT: Overall Attitude; GRW: Growth of Smart Cities

In this study, multiple regression analysis was utilized to test hypotheses incorporating factor scores as variables in the analysis. The independent variables encompassed technology-driven applications, corporate participation, the role of experts, citizen co-creation, city-led strategic governance, and sustainable urban practices. The assessed dependent variable was the overall attitude toward the smart city. The ANOVA results indicated the significance of the overall model, with an F value of 62.961 at the 0.01% significance level and an R-square of 0.555. Table 3 illustrated that in this study, the impacts of technology-driven applications, corporate participation, citizen co-creation, city-led strategy governance, and sustainable urban practices on the overall attitude were found to be significant at a 1% significance level. Additionally, the effect of the role of experts factor on the overall attitude showed significance at a 5% level. As a result, hypotheses H1, H2, H3, H4, H5, and H6 were accepted. Among the significant factors, the study identified the highest effect size for the influence of sustainable urban practices on the overall attitude toward the smart city. This was followed by the effects of city-led strategy governance, corporate participation, technology-driven application, citizen co-creation, and the role of experts on the overall attitude toward the smart city. Notably, the results also indicated that the effect of citizen co-creation on overall attitude exhibited negative impacts.

Table 4: Effects of Proposed Factors on Overall Attitude

Independent Variables => Dependent variable	Standardized Coefficient (t-value/sig)
Technology-Driven Application => Overall Attitude	.147 (2,668***)
Corporate Participation => Overall Attitude	.156 (2.686***)
Role of Experts => Overall Attitude	.141 (2.354**)
Citizen Co-Creation => Overall Attitude	- .146 (-2,810***)
City-Led Strategy Governance => Overall Attitude	.194 (2.897***)
Sustainable Urban Practices => Overall Attitude	.335 (5.500***)

*** Significant at 0.01; ** significant at 0.05

This study also conducted regression analyses to test the effect of overall attitude on the growth trajectory of the smart cities and satisfaction. The results of the ANOVA revealed that the overall model is significant with an *F* value of 323.529 at the 0.01% significance level and an *R*-square of 0.512 in the case of the impacts of attitude on the growth trajectory of the smart cities. Therefore, H7 was accepted. Further, the results of the ANOVA revealed that the overall model is significant with an *F* value of 190.675 at the 0.01% significance level and an *R*-square of 0.382 in the case of the impacts of attitude on satisfaction. Therefore, H8 was accepted.

Table 5: Effects of Overall Attitude on Growth of Smart Cities

Independent Variables => Dependent variable	Standardized Coefficient (t-value/sig)
Overall Attitude => Growth of Smart Cities	.147 (2,668***)
Overall Attitude => Satisfaction	.618 (13.809***)

*** Significant at 0.01

6. Conclusion

This study delved into the essential driving factors that contribute to the growth and success of smart cities, offering a comprehensive analysis of key elements crucial for fostering their development of smart cities. This study investigated the impacts of technology-driven applications, corporate involvement, the role of experts, citizen co-creation, city-led strategy governance, and sustainable urban practices on overall attitudes towards smart cities. Additionally, this study examined the influence of these attitudes on the growth trajectory of the smart cities and satisfaction with smart cities. The results of this study found that the impacts of technology-driven applications, corporate involvement, citizen co-creation, city-led strategy governance, and sustainable urban practices on overall attitudes towards smart cities significant at 0.01 level, while the impact of the role of expert on overall attitudes towards smart cities significant at 0.05 level. Regarding the effect size, the results of this study found that the impact of sustainable urban practices on overall attitude towards smart cities showed greater than other impacts. This study also found that the impact of citizen-led strategy governance on overall attitude towards smart cities was greater after the impact of sustainable urban practices on overall attitude towards smart cities. This study found that the next greater impact factor on overall attitude towards smart cities was corporate participation. This study also found that the impact of citizen co-creation on overall attitude towards smart cities showed significant, but negatively that are different from the goal of Smart City 3.0 that emphasized the role of citizen co-creation (McQuire, 2023). Therefore, the results showed how citizens perceive the participation on smart cities will help improve smart city development negatively form attitude. The possible explanations to these results might include citizen's beliefs and evaluation of the smart city development are not associated with how much they play a key role by providing opinions, participating city development issues, and providing ideas for decision-making. Simonofski et al. (2019) addressed that smart cities can provide innovative solutions in various domains such as environment, economy, mobility, and safety with technology, while it is only possible if the citizens are involved in the design of the smart city. However, the results of this study raise the concern how citizens in South Korea perceive the fact that citizen participation is pivotal for the development of smart cities. The results also provide implications regarding the role of cities and its stakeholders consider to provide such opportunities to citizens. Other findings include that the impacts of technology-driven application and role of experts on overall attitude towards smart cities showed significance, while the impact of role of experts on overall attitude towards smart cities showed with lower effect size compared to other effects. The results also found that the impacts of overall attitude on the growth trajectory of the smart cities and satisfaction with smart cities showed significance.

The results offer managerial and policy implications. First, there is necessity of promotional policies related to the importance of citizen co-creation for the growth and success of the smart cities. Effect size of role of experts on overall attitude toward the smart city was relatively lower, while listening to experts' opinions through various communication tools might help enhance awareness of smart cities. Stronger effect size of sustainable urban practices on overall attitudes towards smart cities implied that citizens perceive sustainable and environmental issues could be resolved with the application of smart cities in a society. Citizens also perceive the importance of technology-driven applications and consider it as necessary factor for the growth of smart cities. Corporate involvement on smart cities, as a key driving factor also help improve competitiveness of smart cities. The development of smart cities is an ongoing process that requires collaboration across government agencies, private sector entities, and the active involvement of the community. Therefore, it is important to prioritize inclusivity, sustainability, and adaptability to emerging technologies throughout the development of smart cities. Specifically, this study suggests that the business environment should be improved through the development of promotional policies. This, in turn, enables corporates to actively contribute to the

advancement of smart city development and enhances the overall competitiveness of the smart city.

While this study presents valuable insights, it is essential to acknowledge its limitations and propose avenues for future research. The data analysis was confined to leading smart cities in South Korea, prompting a suggestion for future investigations to expand the scope by analyzing data from smart cities globally. Additionally, enhancing the sample size to encompass various generations would contribute to a more comprehensive understanding. Future studies could explore the impact of cultural and societal factors, as well as government initiatives, across diverse cities and regions to provide a more nuanced perspective.

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