

A Citizen Participation Approach for Songdo Smart City Study

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Abstract. This paper aims to explore the level of citizen participation in the Songdo smart city project, once called U-city project, in order to provide citizens with U-service anywhere by using new IT technology in the Incheon Free Economic Zone, a landfill site. To this end, it reviews the literature on smart city, and derives project's problems, evaluates according to the framework, and proposes implications. This paper uses the "Citizen Participation Evaluation Framework" formalized by Simonofsky and his colleagues and analyzes civic participation method by dividing it into democratic participants, co-creators, and ICT users. The level of citizen participation in the Songdo project is evaluated according to the criteria presented by this framework and the results are presented. The analysis period is from 2003 to 2016, when the government office was opened and the initial foundation was completed. As a result of analysis, Songdo had built open data and infrastructure for citizens, but citizens were participated as ICT users only. Although citizens living in smart cities should be the co-creators and participants in democratic decision-making for solving urban problems, Songdo was missing these factors. In conclusion, this paper argues that Songdo remains in the U-city paradigm as the 'smart people', a key element among the smart city components, has been neglected and ultimately reveals a fundamental limit to its growth into a sustainable smart city. In addition, suggestions for improvement are presented. This paper is meaningful in that it presented lessons and implications that the human factors should be emphasized as the subject of technology and services to develop into an authentic smart city through the case of Songdo.

Keywords: smart city, sustainable development, u-city paradigm, citizen participation evaluation framework, smart people

1. Introduction

A smart city is known to provide citizens with services such as crime prevention, disaster, transportation, environment, and energy using ICT in order to raise the standard of living of citizens. It is mainly characterized by providing a variety of app-based application services in areas such as traffic, safety, life, and crime prevention by newly building a physical foundation in a new city and applying wired/wireless IoT technology based on it (smartcity.go.kr). In that sense, it can be said that technology has the power to upgrade the quality of citizens' lives by making governments more responsive to citizens' needs. However, many researches and plans surrounding smart city so far have been driven by technology rather than citizens' demands, so the human aspect has been criticized for being overlooked. Eventually, smart city that excludes citizens has limitations in its sustainable growth as a city due to its technological orientation, so it is essential to increase the satisfaction and loyalty of citizens to the city through a citizen-centered approach.

Songdo, the subject of this paper, belongs to the Incheon Free Economic Zone (IFEZ) in the southwest of Incheon Metropolitan city along with Yeongjong and Cheongna. Governmental office of Songdo international city opened in 2003, and invested KRW 45.269 trillion in the construction of new city infrastructure in the three IFEZ districts (total area 132.92 km²) that were reclaimed at the time. The Ubiquitous city (hereafter U-city) strategy was first proposed in Songdo in 2004, and the core of the strategy was to provide various city services by combining IT technology. U-city is an idea as a convergence of ICT services that are accessible regardless of time and space and under this concept, social infrastructure is less emphasized in terms of human and social capital (Lee, et al., 2016). During the construction, Songdo city faced an unexpected problem: the dominant population came to the new city. This population problem inevitably revealed the importance of civic roles and the importance of interaction between city developers, technology vendors, and IFEZ (Mullins, 2017).

The nature of smart city initiatives differs from country to country. Developed countries are pursuing energy efficiency by reorganizing existing infrastructure and integrating ICT, and the European Union has established strategic partnerships related to smart cities between European cities, and developing countries are promoting projects in the form of constructing new cities by investing large-scale capital (Kim, 2019).

After Korea revised U-city Act in 2017 to 'Act on the Promotion of Smart City Development and Industry' ('Smart City Act'), smart city is regarded as a platform that enriches the lives of citizens, enhances the city's sustainability, and fosters new industries according to the application of new technologies of the 4th industrial revolution (Smartcity.go.kr). Songdo, once known as a leader in Ubiquitous city, recently, however, the media and researchers have criticized Songdo for government's top-down planning approach and not taking the civic demands into

account. It can be said that it is difficult for Songdo to grow into a sustainable smart city without solving these problems (Oh, 2020). Currently, Songdo city is in the process of upgrading and expanding its smart city in accordance with IFEZ Vision 2030 (ifez.go.kr). In this regard, this paper assumes that Songdo's smart city project has shortcomings in civic participation to grow into a sustainable smart city, unlike other cities in Europe or the United States, and attempts to explore citizen participation's level. This paper reviews the literature on smart city to explore Songdo's project, derives problems that hinder sustainability from the point of view of citizen participation based on the citizen participation evaluation framework, and proposes implications at the end.

2. Methods

This paper uses the "Citizen Participation Evaluation Framework" formalized by Simonofsky and his colleagues (Simonofski, Serral Asensio, & Wautelet, 2019) as shown in Table 1 and analyzes civic participation method by dividing it into democratic participants, co-creators, and ICT users. The temporal scope is from the opening of the Governmental Office of Songdo International City in 2003 to the year 2016 when the initial infrastructure was completed.

According to the "Citizen Participation Evaluation Framework", there are three types in citizen participation levels by smart city: citizens as democratic participants, citizen as co-creators, and citizens as ICT users. Citizens as democratic participants only have symbolic influence on large-scale decisions such as strategies, and by participating in the decision-making process, they become experts while learning about public issues. In citizen as co-creator, end-users (citizens) actively participate in various stages of production process to co-create public services. Here citizens are important stakeholders who can come up with valuable ideas for social needs. Interaction technology by various types of interviews, living labs, and online platforms are used to collect citizen's opinion. In citizens as ICT users, they can participate more easily by actively using the smart city infrastructure. Here, innovative applications are supported by citizens, providing incentives for them to participate in other applications

This paper also applies a literature review of relevant theoretical and empirical research papers such as papers, periodicals, yearbooks, statistical yearbooks, minutes, government reports, and world-class datasets to achieve research objectives related to conceptual frameworks of smart city and U-city and citizen participatory approach

Table 1: Citizen Participation Evaluation Framework

Category		Evaluation criterion
Citizen as democratic participants	Citizen's selection	Representative group of citizens
		Support for group process
		Competent and unbiased group facilitators
	Agreement on the goals of the smart city strategy	Evidence that citizens helped define goals and objectives
		Citizen-oriented goals and objectives
	Correlation between participation activities and achievement of goals	Formality and transparency of the course of action
		Evidence of interaction between citizens and other actors
Evidence of the influence of citizens' input in priority setting of the projects		
Citizen as co-creators	Direct interaction	General techniques applied
		Type of requirement engineering method applied
	Living lab	Living lab strategy and planning
		Citizen-oriented activities organized
	Online platforms	Use of an existing or specifically designed online platform
		Number of citizens that participate on the platform and impact on public life
Citizen as ICT users	Infrastructure	Ubiquitous computing components
		Innovative ICT based project
	Open data	Open data strategy
		Citizens' use of open data

3. Results

3.1. Concept of U-city

U-city is a concept established before the Act on the Construction of Ubiquitous City was enacted in 2008. Korea Smart City Association (KSCA) defined U-city, based on Basic Plans for U-city from the Ministry of Information and Communication as follows: U-city is a future high-tech city where IT infrastructure, technology and service are integrated into housing, economy, traffic, and other facilities (smartcity.or.kr).

1. Quality of life is improved by U-Traffic, U-Home (convenient city), U-Security, U-Facility Management (safe city), U-Environment (clean city), and U-Health Care (healthy city) service.
2. The new IT market is created where hardware/middleware/platform technologies involved with sensors, tags, and terminals; and communications and applications services related to software, BcN, USN, Wibro, and HSDPA are integrated.

Hwang (2005) defined U-city as a city to which the ubiquitous concept is applied, where information can be exchanged and responded to by accessing the network anytime, anywhere. In other words, the ubiquitous society refers to a society in which various things are combined in various ways to acquire intelligence through ICT technology. Lee et al. (2016) defined U-city as a space where information exchange can be freely combined with service, information communication, and infrastructure management systems. In addition, they explained that the Korean brand name of U-city was made from a compound word of 'city' and 'ubiquitous' in the article. Under the U-city, it is basic to install sensors or CCTVs in urban infrastructure such as roads and bridges, or to build networks to avoid school crimes or disaster. Cho & Kim (2009) argued the legal basis for the birth of the U-city concept as follows: in 2003, Korea applied the concept of U-city, which means a livable city made of ICT, to Songdo new city, and as a result, a project for the construction of a new city that fuses ICT technology to urban infrastructure was started. As an "Act on the Construction, ETC. of Ubiquitous Cities" (in brief, Ubiquitous Act) was enacted, the legal basis for construction, and management of the U-city was prepared afterwards.

As such, the U-city project mainly considered urban infrastructure using information platforms, but the scope has since been expanded to activate advanced facilities and systems in the new town (Hyun, Yoo, Hyun, & Kim, 2020).

3.2. Concept of Smart City

Currently, smart city is defined in various ways depending on the point of view of researchers. A smart city by the definition of the International Telecommunication Union (ITU) is an innovative city that utilizes ICT to improve the quality of life, efficiency of city operations and services, and competitiveness (itu.int). European Commission defines a smart city as a city that utilize digital technology to provide better public services for citizens, use resources more efficiently and reduce environmental impact, ultimately improving quality of life and increasing urban sustainability (ec.europa.eu). Smart City Korea emphasizes that in general, smart city is a platform for improving the quality of life for citizens, enhancing the sustainability of cities, and fostering new industries by utilizing the innovative technologies of the Fourth Industrial Revolution (smartcity.go.kr). Taken together, a smart city can be defined as a city model that can solve complex and diverse urban problems and upgrade the quality of life of citizens by combining new ICT technologies such as big data and IoT with the city. However, as reviewed so far, in brief, U-city and Smart city are similar in that they apply new technologies such as ICT to cities, but have different characteristics and operation methods as shown in Table 2.

3.3. Components of Smart City

Many studies present various components of smart city according to the point of view. ITU presents six components of a smart city: smart living, smart people, smart environment and sustainability, smart governance, smart mobility, smart economy (itu.int). Smart City Korea (smartcity.go.kr) explains the four components of a smart city: smart infrastructure, smart services, smart people, and smart data. The two institutions include smart people as a component to implement a user-centred smart city rather than a provider-centred smart city. In other words, it is emphasized that citizens should participate from the initial stage and take the lead after the infrastructure is built. As above, several studies have begun to emphasize the implementation of citizen-centered smart cities since the mid-2010s to the aim of enhancing the quality of life rather than introducing new technologies.

Table 2: Comparison between U-city and Smart City

Category	U-city	Smart city
Business & propelling system	<ul style="list-style-type: none"> - Focusing on infrastructure for new city development and on supplying public service - Ministry of Land, Infrastructure & Transport 	<ul style="list-style-type: none"> -Data-based practical urban problem solving including infrastructure - Open governance made up of the public institution, private companies and citizens
Technology & information transfer	<ul style="list-style-type: none"> - Wired internet network, broadband sat, 3G, RFID - One way transfer 	<ul style="list-style-type: none"> - Wired and wireless network, new technology(IoT, Cloud, Big data, Mobile) - Two way transfer
Users & participation	<ul style="list-style-type: none"> - User(citizen) as an information consumer - Difficulty using city data - Participation possible after the infrastructure construction stage 	<ul style="list-style-type: none"> - User(citizen) as information producer and provider - Implementation of a platform for linking and sharing data - Participation possible even before the infrastructure construction stage

3.4. Diagnosis of Problems in Songdo as a Smart City

Songdo city started the U-city pilot project by investing a total of 5.6 billion KRW in the U-city pilot site since 2009. At that time, IFEZ, the project subject of Songdo, signed a contract with KT to establish and operate public U-services in Zones 2 and 4. Specific services to be provided include WI-FI service, intelligent situation awareness security service, public parking lot service, and delivering public information through the home network. In addition, for private sector services,

IFEZ launched a private Special Purpose Corporation (SPC) in 2011 and operated U-services. Companies participating as investors in SPC were Incheon Development Corporation, Cisco, Portman, KT, NSIC, and Samsung SDS.

As a result of reviewing the literature on smart city, several problems facing Songdo city are as follows. The first problem was that in the early stages of construction, Songdo understood the concept of U-city as building a public communication infrastructure that enables U-services. However, under the law at the time, the public communication network had to provide only public services that could not charge citizen users, so the city could not develop or provide paid personal U-services through the communication network. In other words, this was the reason why Songdo started its business with four public sector U-services, and there was no consumer-centric business model to generate profits from public infrastructure, so Songdo could not afford the operating costs of U-city. The second problem is that Songdo has focused on the U-city only in the areas of general public information and surveillance services. For example, only public services such as crime prevention, which only worked in public places where networks, sensors, and CCTV are installed, were connected to the private sector of private buildings, which inevitably reduced efficiency. The third problem is that, as shown in Table 2, the key element of a smart city requires an interactive service in which citizen users participate, but Songdo was absolutely lacking in this regard. Rather, the government-led service supply and top-down approach and operation methods far from citizen participation proves that Songdo itself was immersed in the U-city paradigm.

4. Discussion

The results of analyzing the level of citizen participation in Songdo project based on the “Citizen Participation Evaluation Framework” are as in the Table 3 below. As a result of analyzing the level of citizen participation in Songdo city, it was derived that the citizen participation of Songdo smart city corresponds to the level of IT users and still does not break away from the U-city paradigm.

Table 3: Applying the Citizen Participation Evaluation Framework to Songdo Case

Category	Evaluation criterion	Songdo case
Citizen as democratic participants	Citizen’s selection	The early U-city project in Songdo was government-led from the beginning, and only the project vision contained that it would provide a convenient, pleasant and healthy living environment for citizens. From the initial stage of the project, citizens did not
	Agreement on the goals of the smart city strategy	

	Correlation between participation activities and achievement of goals	participate in establishing project goals and strategies, and there was little interaction between citizens and other actors.
Citizen as co-creators	Direct interaction	As smart services in transportation, energy, environment, welfare, and administration were provided in a top-down approach, user citizens, had poor sensibility and were not motivated in service value improvement activities. Therefore, living labs and online platforms that apply citizens' ideas to public services could not be activated.
	Living lab	
	Online platforms	
Citizen as ICT users	Infrastructure	As the infrastructure such as U-service, network, and integrated control center, which are key elements of U-city, was built, citizens became accustomed to using public information through Wi-Fi, CCTV system, broadband, and home network. However, since public data was operated privately, citizens were only able to participate at the level of ICT users.

5. Conclusion

Songdo started as a ubiquitous city and is evolving into a smart city. However, as we have seen in this paper so far, it was found that the smart city project of Songdo has a limit in moving to a sustainable smart city in reality due to the lack of public awareness due to the public-led service supply method from the initial stage to the intermediate stage. Above all, as in the analysis, it is predicted that it will be difficult to realize a true smart city with citizen participation at the level of ICT users. Therefore, it should pursue innovation and change as a people-centered smart city according to the renewed smart city concept. In conclusion, this paper suggests that in order for a smart city to be sustainable in the view of citizen participation, democratic participation of all citizens should be encouraged under an e-voting system that reduces decision-making time, cost, and bias. In addition, it is proposed to consider citizen participation from the perspective of co-creators participation to activate ideas by engaging citizens in the design and implementation process of living environment improvement projects to elevate the quality of life.

It is meaningful in that this paper presented lessons and implications that the human factors should be emphasized as a key point of technology and services to transfer to smart city through the case of Songdo city. However, since the analysis results of this paper were presented according to the subjectivity of the researcher through literature analysis, a follow-up study using a quantitative analysis method based on a more sophisticated evaluation framework tool can be expected in the near future.

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References

Bifulco, F., Tregua, M. Amitrano, C.C., & D'Auria, A. (2016). ICT and sustainability in smart cities management. *International Journal of Public Sector Management*, 29(2), 132-147

Cho, C. M., & Kim, J. H. (2009). Study on the Legal Establishment of U-city Management Center; Focusing on its Function and Location. *Journal of GIS Association of Korea*, 17(3), 269-276.

European Commission. Smart Cities (2021). https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en

Hwang, J. S. (2005). Issue Analysis for the Concept and Implementation Strategy of U-city. *Communications of the Korean Institute of Information Scientists and Engineers*, 23(11), 5-12.

Hyun, J. W., Yoo, K. S., Hyun, D. H., & Kim, C. K. (2020). A Study on the IoT LED Streetlight Convergence Technology for Smart City Service. *Journal of Next-generation Convergence Technology Association*, 4(2), 135-143.

IFEZ. IFEZ Vision (2021), Strategy Proclamation 2030. <https://www.ifez.go.kr/eng/noti4/400>

Incheon Smart City. <https://www.incheonsmartcity.com/default/>

International Telecommunication Union. ITU-T, Smart Sustainable Cities at a Glance. <https://www.itu.int/en/ITU-T/ssc/Pages/info-ssc.aspx>

Karthikeyan, M., Subashini, T. S., & Prashanth, M. S. (2021). Real Time Face Recognition based Smart Lab for Energy Conservation. *Webology*, 18(Special Issue on Information Retrieval and Web Search January).

Kim, D. H. (2019). From Smart to Smarter with Citizen Participation: Lessons from Songdo U-city Project. KIPA Case Study Series, 4

Korea Smart City Association. <http://www.smartcity.or.kr/en/ucity/concept.php>

Lee, S. K., Kwon, H. R., Cho, H. A., Kim, J. B., & Lee, D. J. (2016). International Case Studies of Smart Cities: Songdo, Republic of Korea. Inter-American Development Bank. <https://publications.iadb.org/en/international-case-studies-smart-cities-songdo-republic-korea>

Malek, J. A., Lim, S. B., & Yigitcanlar, T. (2021). Social Inclusion Indicators for Building Citizen-Centric Smart Cities: A Systematic Literature Review. *Sustainability*, 13(1), 376

Mullins, P. (2017). The Ubiquitous-eco-city of Songdo: an Urban Systems Perspective on South Korea's Green City Approach. *Urban Planning*, 2(2), 4-12.

Oh, J. S. (2020). Smart City as a Tool of Citizen-oriented Urban Regeneration: Framework of Preliminary Evaluation and Its Application. *Sustainability*, 12(17), 6874.

Simonofski, A., Serral Asensio, E., & Wautelet, Y. (2019). Smart Cities: Issues and Challenges: Mapping Political, Social and Economic Risks and Threats. Chapter 4. Citizen Participation in the Design of Smart Cities: Methods and Management Framework. Amsterdam: Elsevier, 47-62. DOI <https://doi.org/10.1016/C2018-0-00336-9>

Ministry of Land, Infrastructure and Transport: Smart City Korea. What is a smart city? <https://smartcity.go.kr/en/%ec%86%8c%ea%b0%9c/>

Ministry of Land, Infrastructure and Transport: Smart City Korea. Law & System. <https://smartcity.go.kr/en/%EC%A0%95%EC%B1%85/%EB%B2%95%C2%B7%EC%A0%9C%EB%8F%84/%EC%8A%A4%EB%A7%88%ED%8A%B8%EB%8F%84%EC%8B%9C-%EB%B2%95%EB%A0%B9/>