Smart City Implementation and Citizen Engagement in Indonesia

R D Kusumastuti1* and J Rouli1

1 Department of Management, Faculty of Economics and Business, Universitas Indonesia, Depok, 16424, Indonesia, ORCID ID: 0000-0001-9827-7718

Abstract. The smart city concept has been implemented in countries worldwide as the solution for various urban problems. In Indonesia, the smart city movement was initiated in 2017 to create 100 smart cities. Previous studies identify challenges to the implementation and that smart people or smart citizens are essential dimensions of a smart city. This study aims to gain insights into the smart city implementation and citizen engagement in Indonesia through the online social network by conducting a focus group discussion (FGD) with four academicians and in-depth interviews (IDIs) with six representatives of the related government institutions. FGD and IDIs indicate that the implementation of smart cities should be adjusted according to the local situation. The critical success factors of the implementation are namely, local wisdom, transformational leadership, sustainability, and political content. The results also reveal that, in general, the city residents have been involved in implementing the smart city through the online social network. However, a kind of incentive system is still required to ensure that the city residents are encouraged to solve the city problems.

1. Introduction
The urban population in Indonesia is projected to increase by almost 20 percent from 2010 to 2035 [1]. The increase in population is followed by the emergence of several typical urban problems, such as reduced residential land, decreased quality of public services, increased road congestion, increased crime rates, garbage accumulation, and other social problems [2]. The need for energy and natural resources will also increase along with the increase in population and the existing problems. Hence, a fast and appropriate strategy is needed to overcome urban problems while maintaining the sustainability of city life. One of the concepts that can solve urban problems and is currently developing in the world, including Indonesia, is the smart city concept. Through the Ministry of Communication and Informatics and other ministries, the government of Indonesia pioneered a movement to convert cities into smart cities known as the "Movement Towards 100 Smart Cities" in 2017. This movement aims to prepare 100 cities/regencies in Indonesia to become smart cities in 2019.

The smart city is a city management concept based on information and communication technology (ICT) to help solve urban problems [3]. In addition to addressing urban problems, the purpose of the smart city implementation is to improve citizens' quality of life by managing city assets and resources effectively and efficiently. Tan and Taeihagh [4] state that the smart city concept is viewed to provide innovative solutions for city problems. However, smart city implementation, especially in developing
countries may require adjustments due to the lack of proper infrastructure, funding, and economic growth [5].

Furthermore, Hollands [6] states that the smart city implementation requires sophisticated ICT and an essential role from citizens. A city is considered smart when investments in human and social capital, conventional transportation, and modern (ICT) infrastructure can foster long-term economic growth and a good quality of life through democratic governance and intelligent use of natural resources—[7]. Academics and professionals say that (smart) residents do an essential part in smart cities by participating in (smart) governance and having (smart) appropriate behavior [8]. This statement is reinforced by Hollands [6], which states that the actual smart city starts from people and human capital supported by ICT to consult in determining the management of the city where they live.

The smart city implementation can be seen in several of projects or initiatives undertaken by the city government to achieve its goals. The biggest challenge in carrying out this initiative lies in the coordination carried out with citizens, considering whether the final goal of a smart city is improving their quality of life. Generally, the implementation of smart city projects or initiatives is carried out on a top-down basis by applying the use of ICT to manage transportation, control congestion and monitor energy and pollution [9]. However, the goals of implementing smart cities are often not achieved because citizens are adequately involved, or the impact of the implementation in their daily lives is not considered [10-11].

Understanding how the smart city concept is implemented in developing countries is fundamental [4], and citizen engagement as a critical component in implementing a smart city is essential to understand [12]. Thus, this study aims to investigate the smart city implementation (i.e., opportunities and challenges) and the role of citizen engagement in smart cities in Indonesia.

1.1. Literature review

The development of the smart city concept began in the 1990s. The term “smart” is often interchanged with the term “intelligent” or “digital” [13]. At the beginning of this term, the focus of the smart city concept was the use of ICT in modern infrastructure in cities [13]. Over time, many new concepts of smart cities are developing globally, and the focus of smart cities is not only on the utilization of ICT but includes several other things. Nam & Pardo [14] distinguish several smart city concepts based on three categories, namely, people (diversity, creativity, and education), and institutions (policy and governance), and technology. Meanwhile, Giffinger et al. [15] pinpoint the components of a smart city, namely the industry, education, participation, and technical infrastructure.

Giffinger et al. [15] also propose six elements in the smart city: smart governance, smart mobility, smart economy, smart living, smart environment, and smart people. The smart economy dimension is related to innovation and productivity in cities. Smart mobility includes all actions taken in managing traffic and sustainable transportation in cities and increasing the public spaces’ accessibility. Smart governance is related to the governance model followed by all actors, while the smart environment is related to the city’s sustainable management of its natural resources. Smart living, on the other hand, refers to all actions taken to meet the needs of citizens, e.g., education, health, safety, culture, and entertainment. Lastly, the dimension of smart people is related to social issues like building an inclusive and participatory community [16].

Previous studies agree that the smart city concept may help cities to solve their problems by providing innovative solutions based on technology. Tan and Taeihagh [4] reveal that in the developing countries, the smart city development is motivated by the need to enhance public service delivery, quality of life of citizens, collaborations of all stakeholders, and inclusivity of disadvantage and vulnerable communities. However, according to Hamza [5], the implementation in the developing countries should be adjusted according to their conditions, as they may have to deal with poverty alleviation, cultural barriers, inequality, and increased urbanization. Furthermore, Tan and Taeihagh [4] find from the literature that there are obstacles to smart city implementation in the developing countries, namely: budget constraints, lack of investment in fundamental infrastructure, lack of readiness in infrastructure, fragmented authority, lack of regulation and framework safeguards, lack of skilled human resources,
lack of inclusivity, environmental concerns, lack of citizen engagement, and lack of technology literacy among the citizens.

Hence, humans play a vital role to ensure a successful smart city implementation. Smart city models introduce power redistribution in cities through the use of ICT [17], and Barsi [18] adds with an emphasis on the significance of human and social capital. Naturally, a smart city needs its citizen to participate and be involved in city management and governance [19]. Meanwhile, Castelnovo et al. [20] state that citizen engagement is one of the crucial elements of smart city governance. Melloul et al. [21] add that the government not only creates new ICT-based services to increase citizens’ standard of living but also engages citizens in these new services.

In general, citizen participation is defined as the engagement of citizens in organized activities to achieve common goals without obtaining rewards [22]. In particular, citizen engagement in smart cities is marked by the existence of a new form of city management to find joint solutions (co-create) to local challenges that rely on the use of ICT by citizens [23-24]. The process of finding a joint solution can be done through dialogue and deliberation between stakeholders [25].

There are various forms of citizens’ participation and engagement in smart cities. Medaglia [26] identified forms of citizen participation such as petitioning, campaigning, consultation, activism, online voting, decision-making, and online debates. Meanwhile, Arnstein’s ladder of participation illustrates the stages of citizen engagement that are often used in decision making and planning [27]-starting from the lowest rung of the ladder, namely "manipulation," with no participation or top-down and one direction. The next rung is "consultation" to obtain opinions or opinions to the top rung of the ladder, namely "citizen control" as the highest form of involvement from citizens, by participating in decision making [28].

In general, the smart city is applied through projects or initiatives with a top-down approach. This one-way approach is one of the causes of not achieving the goals of the smart city project [29]. As the beneficiaries of this smart city project, residents are rarely consulted to determine what they need and their ability to contribute or be involved [30]. There are two significant benefits of using ICT, especially social media, enabling two-way discussions of public issues. First, the cost of disseminating information related to local public policies and issues is lower than when using newspaper media or radio advertisements. Second, helping the government feel the community’s sentiments and expectations towards new ideas so that the government will focus on transparency, be more effective in engaging citizens, and build trust by considering citizens’ responses and contributions to public issues [31-33].

In recent times, social networking sites have emerged as platforms that are very well known as a means of interaction. Social media, which is currently proliferating, is used by many cities as a channel of information. The Norwegian city of Sarpsborg uses Facebook as a medium of active interaction and dialogue between the government and its citizens. The city uses Facebook to provide the latest regular news and responses to citizens’ requests and questions in a short amount of time [34].

However, central and urban governments worldwide face many challenges related to citizen involvement in smart city implementation. Among them is a digital divide, such as unequal access to infrastructure (e.g., computers, mobile phones, and the internet) in India’s homes of urban citizens [35]. Falco and Kleinhans [36] mention other challenges in the form of digital illiteracy, advances in technology and data management, organizational factors consisting of processes and the availability of human resources, and etcetera. In addition to challenges related to technological citizen empowerment, what is also important is how to encourage and engage citizens and pass on the benefits of smart city projects to citizens through regular communication [37]. The government should not depend only on one form of public participation but look for various other forms of participation that citizens can play from the development stage to the implementation of smart city projects [38]. The low competence of citizens related to ICT and the issues being discussed (e.g., energy issues) is a challenge in engaging citizens in smart city projects [8].

In addition to the challenges, there are also good opportunities that can be used to engage citizens in implementing smart cities. Although the research describes the guidelines, for implementing social media is relatively scarce. The development of social media with various existing applications and
extensive user base is one good opportunity that can be used to engage citizens in smart city projects [34].

2. Method
In this study, qualitative methods are employed. In-depth interviews (IDI) and focus group discussions (FGD) are conducted with representatives from the central government, the local government of Jakarta, and academics. The IDIs are carried out with two representatives of the government of Jakarta, two representatives from the National Development Planning Agency (Bappenas), two representatives from the Ministry of Communication and Information. At the same time, the FGD (with four academicians from established academic institutions in Indonesia), is conducted to obtain insights concerning the smart city development/implementation in Indonesia. Whether the implementation has also included citizens’ participation, the use of social networks in the implementation, barriers of citizens engagement and factors influencing smart city implementation in Indonesia, the IDIs last for about 45-75 minutes, while the FGD lasts for about two hours. The IDIs and FGD are recorded, transcribed, and analyzed.

3. Results and discussion

3.1. Smart city implementation in Indonesia
According to one of the FGD participants, there is a difference in vision between the 100 smart city movements initiated by the Ministry of Communication and Information and the vision of a sustainable city as outlined in the sustainable urban system by Bappenas. However, there are several overlapping dimensions. The results of the FGD with academicians also explain why these differences occur. Literature discussing smart cities can be traced back to the American literature, which is more technology-driven, while the European literature is more focused on the "city". The term smart city is used interchangeably with green, and energy-efficient cities in European literature. The sustainable urban system by Bappenas is adopted from International Organization for Standardization (ISO), which is based in Europe. In contrast, the Ministry of Communication and Informatics adopts the smart city concept promoted by Citiasia Inc., an American-based company. The difference in vision causes the difference in the dimensions. The dimensions of a sustainable city are economic, socio-cultural, governance, green, and resilience. In contrast, the dimensions of a smart city are smart economy, smart living, smart governance, smart environment, smart branding, and smart society, almost similar to the dimensions from Giffinger et al. [5].

According to the academicians, the smart city concept must be adapted to Indonesian conditions, which is consistent with the statement from Hamza [5]. Furthermore, the informant from the Ministry of Communication and Information even adds that the smart city implementation must be adapted to the conditions of the city itself. One of the academicians defines a smart city as one that uses technology as an enabler to increase the quality of urban life so that it becomes a city that can manage its various resources, such as natural resources, human resources, and time and heritage resources. The success of implementing a smart city concept in a particular city requires a comprehensive approach of technology, people, and processes, as well as data (data-driven smart city, data-driven smart transportation, data-driven smart health, etc). The success of implementation is also consistent to the statement from Tan and Taeihagh [4]. The academician also says that the real target of a smart city is ecological, political, social, and economical.

In addition, the academicians also say that the successful implementation of smart cities depends on local wisdom, transformational leadership, sustainability (the program must continue even though regional heads change), and political content. In general, the factors that influence the implementation of smart cities in Indonesia are resources (natural resources, human resources, and time and heritage resources), enablers (people, basic infrastructure, governance, and culture), and services (the generated services).

The academician’s further mention that even though the smart city concept provides significant benefit to the city, there exist challenges in its implementation. First, smart cities need the support of
local regulations as it requires budget allocation. Second, the resources needed for the smart city implementation (e.g., people and IT facilities) are limited and vary across the local government’s divisions. Third, it is challenging to perform information sharing between divisions in the local government due to the existing silos.

3.2. Citizen engagement in the smart city implementation

According to the informant from the Government of Jakarta, the smart city implementation in Indonesia has involved the community. The follows the academician statement who states that smart cities will become more meaningful when there is active citizen participation. The two informants said that Jakarta had entered Smart City 4.0 or the era of co-creation. In the context of mobile first, Jakarta has a platform called JAKI or Jakarta Kini. Which is a super app, an application center, and services from the Government of Jakarta that provides not only services provided by the Government but also services or innovations developed by the citizens and startups (for example, Qlue application to receive complaints from the citizens of Jakarta, which similar to the application mentioned in [30]). Meanwhile, the citizens have been engaged because Jakarta Smart City (JSC) has a CRM system (fast public response), which one of the channels is Facebook (similar to [34]) and Twitter, as an example of online social network. Whereby every report submitted by the citizens will be recorded and visualized.

However, according to academicians, the challenge of engaging the citizens in the program is an incentive system is also needed to ensure that the citizens are willing to be involved or report the city problems, similar to Vanlı and Marsap [37]. An informant from the government of Jakarta states that the approach has been carried out by the previous governor of Jakarta and became a polemic due to providing incentives to the participated citizens. Moreover, the challenge to engage the citizens in a smart city is how to condition the citizens in the context of co-creators, no longer as participants, so that there is a sense of belonging (a sense of togetherness) from every community to be able to implement smart cities in their respective regions.

According to the informant from the government of Jakarta the use of online social networks in the smart city implementation in Jakarta is done by processing public reports through online social networks using data analytic. These reports, for example, are related to disturbances in peace and order, social assistance, local regulations and etcetera. Meanwhile, the informant from Bappenas states that the use of social networks is carried out by pulling data from Twitter to gather negative sentiment. However, there are some difficulties in determining whether the Twitter users’ position comes from a specific location. On the other hand, the informant from the Ministry of Communication and Information states that social networks to support smart cities have been carried out in several cities, for example for the socialization of city programs. The academician also mentions that online social networks essential (as they can enhance citizens’ engagement [34]). However, it is also essential to ensure that—citizen science, government, and technology can synergize in advancing the standard of living in a city.

4. Conclusion

The Smart city is offered to solve urban problems, but its implementation may have challenges in developing countries. This paper investigates smart city implementation in Indonesia and the role of citizen engagement in the implementation. The IDIs and FGDs results reveal that the smart city implementation should be adjusted to the city’s condition, as each city may face different problems and have a different level of resource availability. The smart city implementation also requires leadership and political commitment to ensure the sustainability of the implementation. Furthermore, citizens engagement plays a significant function in the successful implementation of the smart city concept. However, some incentive is needed to encourage-participation. In addition, online social networks have a significant function in smart cities. However, importantly, there should be a synergy among the citizens’ science, government, and technology to improve the standard of living in the city. This research is not without limitations. A quantitative study that investigates citizens’ intention to participate in the smart city programs is needed to obtain a complete result regarding the role of citizens in the smart city. Future studies may address this limitation.
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