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A Gender-Responsive Approach: Social Innovation for the Sustainable Smart City in Indonesia and Beyond

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A Gender-Responsive Approach: Social Innovation for the Sustainable Smart City in Indonesia and Beyond

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Abstract

The smart city has become one of the many ways to solve the problems of contemporary urban environments. The sustainable integration of technology, people and institutions is essential in urban planning. However, utilizing technology in city management with the Internet of Things (IoT) in smart cities will not be sustainable without ensuring that the community is prepared. The involvement of all societies and persons, as agents of implementation and technology users, requires a gender-responsive approach to social innovation in the urban management. With regard to this issue, the purpose of this paper is to describe the importance of the human aspect of technology orientation through a gender-responsive approach in social innovation for the sustainable smart city. The method used in this study is a combination of several data collection techniques, which are in the form of literature studies, online surveys, and structured interviews. The results show that in terms of planning and management of the city, it is necessary for all communities to achieve social justice by using gender responsive approaches. Social innovation done in smart cities requires an understanding of technology users through community empowerment, especially for women. Women and men should have equal rights and opportunities in the application of the technology. Therefore, various capacity building efforts for women must take place on multiple levels, with the integration and support from the collaboration of all stakeholders. This amounts to a paradigm shift in both the planning policies, regulation and management of smart cities. Cooperation among all parties is critical, whether in partnership or collaboration between government and private parties and other institutions that prioritize public services for the community. This study contributes a social learning framework in strengthening citizens' preparedness to participate in future smart cities.

Keywords: Gender responsive, Social innovation, Smart city, Internet of things (IoT)

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Introduction

One central issue of concern in today's urban communities with high population growth is that they do not mirror the development of industrialization at a comparable speed. A safe, healthy, and fair city is one of the goals of utilizing internet-based technology. This technology is also called the Internet of Things (IoT). Utilization of technology in urban management has the goal of facilitating public services and providing solutions to problems in urban areas. Angelidou (2014) has stated that smart city is a conceptual model with the use of human, collective activities and technological capital for urban development. The efforts of social and institutional revitalization in urban management, by creating a safe and prosperous city environment through the use of technology, will offer positive impacts, as well as improve the dynamics and social life of the public (public realms), especially for economic development.

In Indonesia, the implementation of the smart city in several cities began with the development of technology with broadband network and supporting infrastructure. In contrast to the region's potential, both natural and human resources cause a difference in emphasis and the focus of smart city planning. Plumb, Leverman & McGray (2007) argued that a smart city must improve the learning process in order to face competitiveness and to develop economic development in an urban area, including the local and global economy, in relation to the creative industry (as cited Nam and Pardo, 2011, p. 285). It is very important that the management of smart cities demands the development of knowledge from the community the as implementers and users of technology. Warnecke (2017) explained that there is a large gender gap in the access to technology. Women must have the same opportunities as men, including access to Information and Communications Technologies (ICT). This can enable women to access valuable information, consider a broader range of business opportunities, access wider markets, partake in educational programs, and share experiences as well as to gain mentorship from other women.

Planning a smart city requires the integration and collaboration of all agents for its development, both from communities, governments, to private parties. Future management decisions through learning must be seen as essential for all environmental conservation plans. The plan for environmental conservation in a city is a dynamic process. So far, researchers have focused on only one task to optimize protected areas. Therefore, there needs to be a shift towards a more adaptive approach to the conservation process that involves the participation of the community, especially women. By incorporating the learning process of technology in the conservation process, future conservation will be more effective reducing uncertainty. In the process of gender equitable technological distribution, the management of smart cities demands social innovation from the community. Without such participation of the community and equal distribution to women, the digital divide, which is in reality a gender divide, will not be overcome. Smart cities must develop gender sensitivity and awareness about the needs of women by using inclusion mechanisms. Urban management must proactively build bridges across inequalities between women and men in order for both genders to hold equal positions[4]. Women also have the right to manage the natural environment in order to assist in the preservation of biodiversity and the ecological balance of the city. They must be permitted to exercise their rights to resource security. Reframing the smart city through this ecological and gender sensitive approach render it

[4] While this paper focuses on men and women, the authors are aware that there are multiple genders and that gender diversity is also an important issue in the gender-divide of technology. This paper focuses on the gap between women and men, without reducing women and men to biological essentialism, but it does not explore the inequalities of openly transgender persons or persons of multiple genders who exist on the margins in Indonesia.

safer and more accessible for women and girls. Asteria et al (2018), argued that inclusive, affirmative action approaches to education for women is likely to increase women's participation in watershed management contributing to environmentally friendly cities.

Although the management of smart cities prioritizes the use of technology for public services in environmental management, the process of adaptation and citizens' ability to use the technology are related to social innovation. With regard to the implementation of technology for the management of the city, the readiness of the community with digital literacy capabilities is critical (Utomo and Hariadi, 2016, p.174). Moreover, studies that use gender lenses related to social innovation still require elaboration because they are still limited in number. Saska-Crozier (2016) emphasizes this point, arguing that the development of social innovation programs should pay attention to aspects of gender equality and women's rights especially by engaging women's experiences with existing social innovations. Similarly, Kahler (2011) asserts that social innovation that uses gender analysis is needed in technological and non-technological studies related to social innovation. The purpose of this paper is to describe the importance of a gender-responsive approach in social innovation to design sustainable smart cities. The contribution of this study is as a social learning framework in strengthening people's readiness to participate in smart city planning. Centering human equality must be the main orientation in smart city management, especially for access to and power sharing opportunities for women.

Analytical Framework

The central analytical lens in this paper is the application of a social learning framework through a social innovation approach, which centers citizen empowerment in access to and use of technology in overcoming social and environmental problems. The concept of empowerment through social innovation strengthens the basic needs of individuals. Subsequently, a gender responsive approach provides an opportunity for developing women's abilities, knowledge and adaptation of innovations for the management of smart cities.

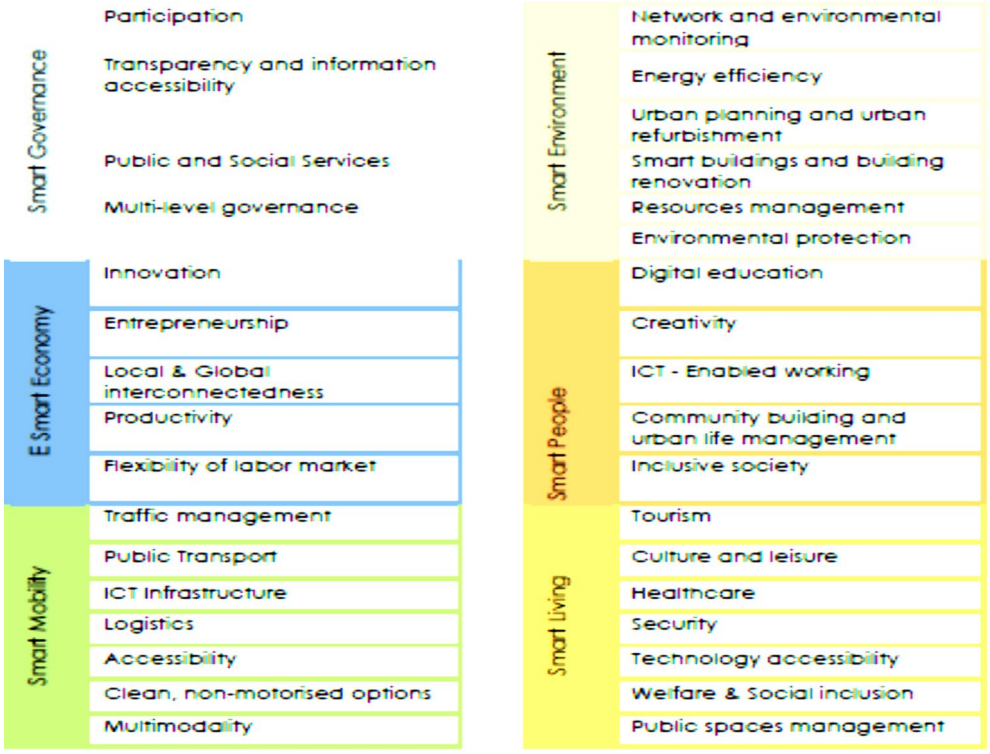
The Smart City and Sustainability

The concept of sustainability of a city is related to smart cities. Smart cities have a vision to achieve a sustainable urban environment and to overcome problems by utilizing technology. The discussion of sustainable cities must explore the relationships among economic, social and environmental issues (Ahvenniemi et al., 2017). Although Jong et al. (2015) focus more on socio-economic aspects, we argue that social justice and greener environmental conditions cannot be overlooked or minimized.

The definition of smart city has many variations with an emphasis on models, frameworks and tools or ways of managing cities using technology. Yigitcanlar and Baum (2008) and Caragliu et al. (2011) explain that technology of information and communication networks in smart cities can improve the competitive advantages of the city (cited in Trindade et al., 2017). According to the Institute of Electrical and Electronics Engineers (IEEE), (Smart Cities.org 2016), the characteristics of a smart economy are: smart mobility, smart environment, smart people, smart living, and smart governance in a smart city. With regard to the reference above, Lombardi, Giordano, Farouh and Yousef (2012) related the six components of a smart city with different aspects of urban life. All aspects of the smart city must be integrated to produce a secure and sustainable environment.

Governments should adopt a paradigm of governance of the city centering the principles of humanity, justice, transparency, accountability, and responsible commitment through the utilization of ICTs and e-Government. Attention to disadvantaged areas should ensue by increasing the productivity and empowerment of communities through inter-regional linkages supported by equitable management of resources. In smart city management, ASCIMER (2017) also examined aspects for smart city implementation and governance frameworks and strategies by classifying manageable areas for the development of each dimension of the characteristics of smart cities. The areas of each dimension can be seen in Figure 1. The characteristics of smart government include four areas of achievement: 1) participation, 2) access to information and transparency, 3) multilevel government, and 4) public and social services. The characteristics of the smart economy in the areas of innovation are entrepreneurship, local and global interconnectedness, productivity, and flexibility of labor market. Industries that take advantage of the development of information and communication technologies will increase business opportunities and anticipate market competition through entrepreneurship development, improve community productivity, and seek interconnection in local and global areas. The characteristics of smart mobility include traffic management, public transport, ICT infrastucture, logistics, accessibility, clean and non-motorised options and multimodality. Subsequently, characteristics of a smart environment include network and environmental monitoring, energy efficiency, urban planning and urban refurbishment, smart building and building renovation, resources management, and environmental protection. The characteristics of smart people include digital education, creativity, ICT enabled working, community building and urban life management, and inclusive society. Finally, characteristics of smart living are tourism, culture and leisure, healthcare, security, technology accessibility, welfare and social inclusion, as well as public space management. The development of cultural facilities is also important to create more creative urban conditions and support the learning process of the community.

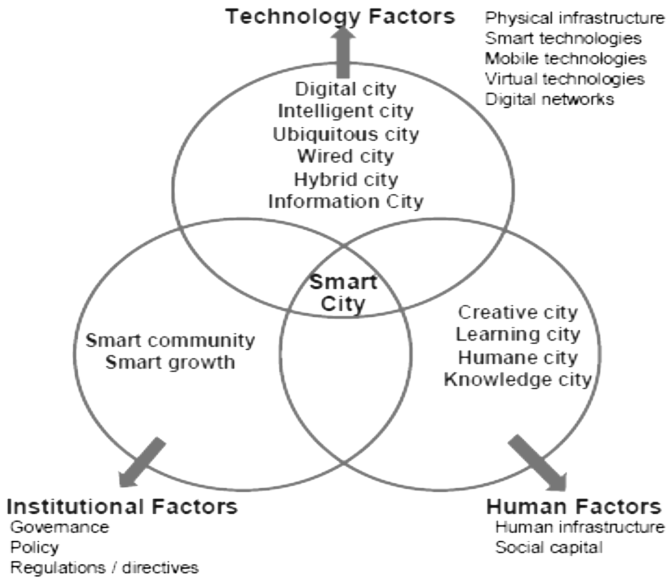
Figure 1. Aspects in characteristic dimensions of smart city



(Source: ASCIMER, 2017)

With regard to Lombardi et al. (2012), IEEE (2016) and ASCIMER (2017), a smart city has three dimensions: technology, human, and institutions factors as elaborated by Nam and Pardo (2011) in Figure 2 below.

Figure 2. Fundamental component of a smart city



(Source: Nam and Pardo, 2011)

The classification of the smart city centering gender equity and human well-being depends upon social learning and education access. Technology alone will not automatically transform and improve city life. The interaction between people in the city is the key to urban management. Increasing capacity building in the smart city can improve citizens' access to education and access public service easily without barriers. It can erase gaps in access to technology based on inequalities of race, religion, gender, education, and disability among other marginalities. Social learning is an important part of digital literacy, avoiding the digital divide and to using digital technologies. Education and capacity building actions should develop digital knowledge that facilitates a learning environment and improves digital technology training in multilevel of sectors such as schools, organizations, institutions and industries. This relates to learning communities as in Villaluz et.al (2018).

According to Dhingra and Chattopadhyay (2016), there is a relationship between the smart city and the sustainable city: sustainability is a goal to be achieved in an adaptable, reliable, scalable, accessible and resilient way. Strategies to improve the quality of life including economic growth for better employment opportunities and improved well-being depend on the efficient delivery of basic services and infrastructure such as public transportation, water supply and drainage, telecommunication and other utilities. All help improve citizens' abilities to address and participate in environmental management issues including climate by providing an effective regulatory and local governance mechanism ensuring equitable policies (as cited in Trindade et al., 2017).

Social Innovation and Empowerment

Although the study of social innovation is not new, lack of collaboration between academia and practical implementation of academic ideas remains (Saska-Crozier 2016). There are multiple, diverse definition of social innovation (as cited in the Amanatidou et al., 2018; Edwards-Schachter & Wallace, 2017; Howaldt & Hochgerner, 2018; Van der Have & Rubalcaba, 2016). Here, we emphasize the relationship between empowerment and social change as defined by the European Commission/European Union (Fougere et al. 2017). Social innovation requires not only the innovations outlined above regarding wide distribution of cost-effective, environmentally sound social services and cost effectiveness, but also improvements in civil society through empowering individuals and groups in the community (both in the regional scope and social change in general). In general, social innovation leads to transformative social innovation (TSI) (Avelino et al 2017; Schröder and Krüger, 2019). Howaldt et.al (2017) have argued that the existence of a mechanism for social change is related to social innovation through learning, variation, adaptation, cooperation, and institutional change. To achieve social needs, development can be in the form of education with a life-long learning approach (Schröder and Krüger, 2019), community development in emissions control and community energy initiatives (Pesch, Spekkink, and Quist, 2018), conservation of flora and fauna, micro credit through social entrepreneurship, online volunteering and various other innovations.

The use of social innovations is usually related to leadership and cultural change, as well as capacity-building activities. Westley and Antadze (2010) have argued that social innovation is a complex process of introducing new products and ideas for their use. The activity of social innovation process impacts social change across society. Brandsen et al. (2016) stress the collaborative aspect of social innovation in the co-design and implementation of solutions to social problems, particularly at the local level. Moreover, according to social innovation theory, co-produced solutions are assumed to have positive societal effects, either through increasing

aggregate utilitarian value, or by empowering citizens in the innovation processes (Ayob, Teasdale & Fagan, 2016). The concept of social innovation that reframes social networks enables less powerful actors with a greater understanding of social problems to co-design new solutions (Farmer et.al., 2018). Therefore, social innovations bring new ideas as solution to social needs. In other words, innovations must be good for society and improve society's capacity to take action for participation (BEPA, 2011, p. 33).

Social innovation is the key to achieve peoples' capacity in innovation adaption to reach more people, organizations and social networks across the city. Social innovation also requires a variety of actors, as agent of social innovation (Westley and Antadze, 2010) and in capacity building of social innovations. Education prepares citizens to adapt the technology in smart city management. The involvement of stakeholders in the development of social innovation is needed to achieve social change, including the government, private groups or profit sector groups, non-profit groups, including individuals and communities (Mizuno et al, 2018). To develop social innovation, cooperation and partnerships are needed from various stakeholders (Schröder and Krüger, 2019).

With respect the existence of social change actors, women have a strategic role to play in making changes and shaping innovations. However, Lindberg and Forsberg (2015) found that there is a gendered knowledge gap in social innovation. According to several studies, women have limited access to technology, and more research needs to be done to explore the ways in which technology itself is gender biased. Thus, through social innovation, empowering women through education can improve knowledge, skills, and access to innovation, for both technological and non-technological. Saska-Crozier (2016) and Kahler (2011) argued that social innovation requires the creation of values by adding women's concerns, enabling women to develop innovations according to their needs and social roles, including finding ways for women to become more financially independent (Kahler, 2011).

Gender-Responsive Approach

A gender-responsive approach (www.endvawnow.org, 2018) addresses gender norms, roles and inequalities in urban planning, to create gender equality. Sustainable smart city management requires the involvement of all communities, including women in urban planning and management. Their participation in as community involvement must consider women's living environments and the conditions of their lives. Women should be engaged in city development plans at all levels to improve women's quality of life, and social roles especially in education, health, economy and politics.

Gender in urban planning is in line with Sustainable Development Goals (SDGs) number 11, with emphasis on making cities and urban settlements inclusive, safe, resilient and sustainable. It is intrinsically linked to goal number 5 on gender equality and empowerment for all women and girls (www.un.org, 2015). Point 5.5 elaborates on the need to ensure women fully participate effectively and equally within opportunities for leadership at all levels of decision-making in the political, economic, and public fields. Moreover, point 5.a ensures women to have equal rights to economic resources and access to ownership and control over land and other property forms, financial services, inheritance, and natural resources, in accordance with national law. Point 5.b also addresses an increase in their active use of technology, especially information and communications technology to promote women's empowerment. Moreover, goal number 11 is also related to the development of the smart city, which is about making cities inclusive, safe, resilient and sustainable. Point 11.6, regarding reduction of the city's environmental impacts per

capita, demands paying special attention to the management of air quality, municipal waste and other forms of waste. Point 11.7 is also relevant, which is to provide universal access to safe, inclusive and accessible conditions, green open spaces and public spaces, especially for women and children, the elderly, and disabled groups (www.un.org, 2015). Furthermore, it is important in global standards of sustainable urban development to be secure, positive, respectful, and provide safe places for all people to live and work in the city without fear of violence or intimidation. These needs to be done in order to achieve social justice in the city.

Based on the review above, a gender responsive perspective is an approach related to gender issues in planning and managing smart cities. While social innovation is a part of technology education, digital literacy is the basis for smart city management, because the readiness of the community as city management actors and technology users is fundamental in the development of the sustainable smart city.

Method

We used a combination of several data collection techniques, including analysis of the literature, online surveys, and structured interviews. We harnessed an integrative literature review (Whittemore and Knafl, 2005), analyzing various articles related to sustainable city development, the gender-responsive approach, social innovation, and the smart city.

Data collection of an online survey included 50 female respondents in Jakarta and had accessed the internet (as a form of communication technology used to access smart city programs). Data collection was conducted in Jakarta because Jakarta has implemented smart city programs since 2014, with the application of QLUE, Jakarta.go.id, Lapor.go.id, and the use of social media as a public service facility in Jakarta. We used convenience sampling and descriptive statistics for analysis, followed by structured interviews with four women respondents based on their active use of technology to manage their environments and disseminate information for environmental management in their communities. Data from interviews were analyzed through the coding process and analyzed by data confirmation.

Results and Discussion

Women's capability to access technology in the smart city

Because we distributed the survey through the internet, women were familiar with the use of technology. However, out of 50 respondents, only 40% accessed applications from smart city programs. They are aware of smart city programs in Jakarta from news on television and online news on the internet. In Figure 3, 48% of respondents were 41-55 years old, and almost all of them, housewives. Of the respondents between 25-40 years, 46% mostly work part time as private employees.

Figure 3. An overview of the age of the respondents

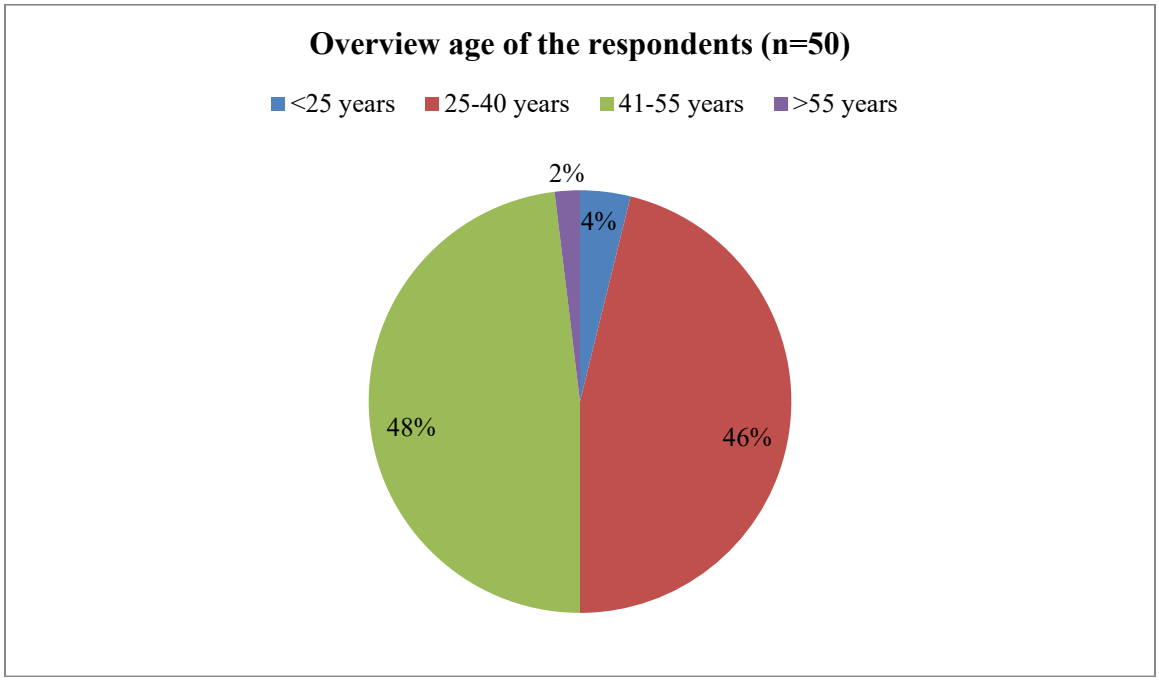
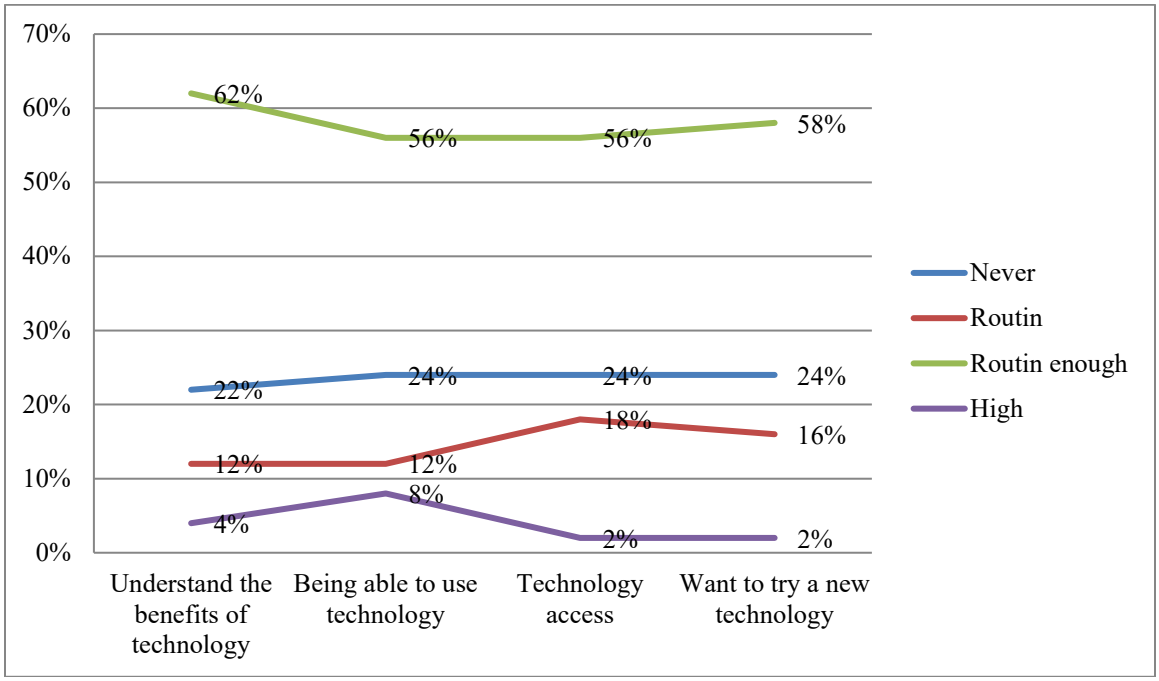


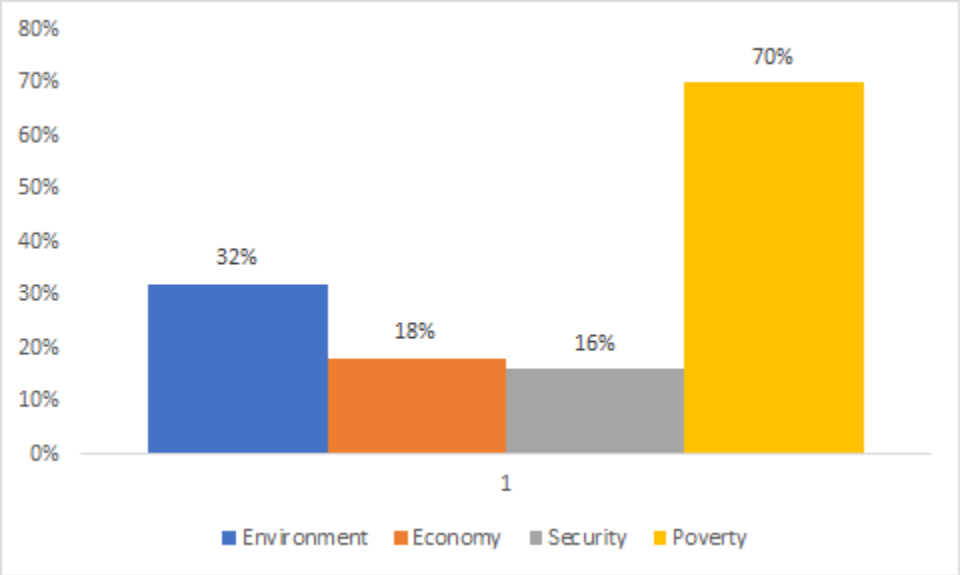
Figure 4. Women's access to technology applications from smart city programs in Jakarta, Indonesia



Regarding women's socialization into smart city programs, respondents reported that they were still lacking. They suggested that more specific information is needed in terms how to access and use mechanisms. Respondents understand the important role of technology is to provide

convenience for access to public services in Jakarta. However, only 56% of respondents use it routinely, even though they are able to use the application and use the Jakarta.go.id website that provides information about the city. In addition, Figure 4 shows that there are still 22% who have never accessed the information, because they do not know how to access it and its benefits. Fifty-eight percent of the women are willing to use the new technology; however, the use of technology also needs to be realigned with the main needs of citizens as users.

Figure 5. Smart city applications: Ranking of issues



In Figure 5, a ranking of issues that need solutions are displayed on the applications of Jakarta smart city programs. Ranking first is the issue of poverty, which was chosen by 70% of respondents, followed by environmental issues, chosen by 32% of the respondents; economic problems:18%, and security issues, 16%. The issue of poverty is related to the level of welfare and income, which remains a problem and is connected to the environmental problems of waste and flooding.

Based on the results of interviews with the four informants, they were able to use the "Go-food" and "Zomato" applications which have been working with the Jakarta government in implementing smart city programs. Informants have benefited from the ease of ordering food and knowing the conditions of the road by using the "waze" application. However, they do not yet know the procedure for submitting complaints through QLUE, report.go.id, or social media in the form of Twitter, Facebook, and e-mail to the government of Jakarta. As informant 4 noted:

> "... Women are also very important to provide input to the government. Yes, unfortunately, they cannot, I also cannot give advice to the village." (Informant 4)

The use of technology clearly needs to be aligned with the conditions of the community, especially for women who have different aspirations and needs compared to male citizens. Moreover, more optimal socialization is needed regarding the application of technology from the smart city program and it is necessary to develop access for women to increase women's participation.

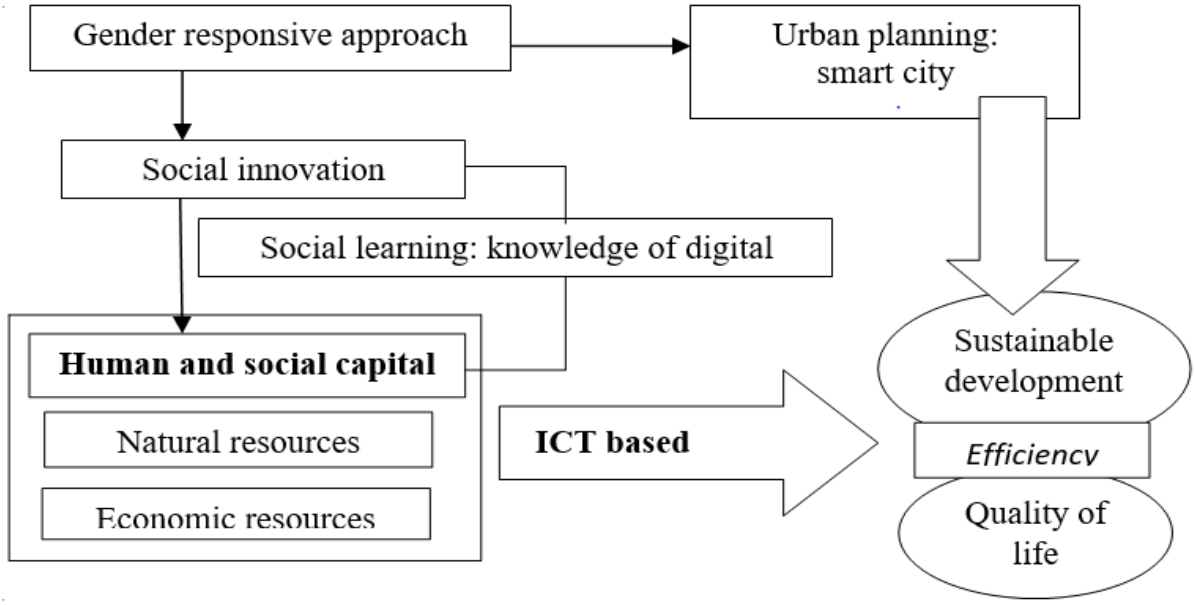
Discussion and Recommendations

Urban digital technologies can reshape citizens' participation and social interaction with city planning. As users of technology they can access social media to share knowledge and explore creativity (Townsend, 2013). The implementation of social innovation requires the support of various stakeholders, because it needs the integration of the government (institutions) through policies and regulations, the availability of technology through partnerships with the private sector, and community involvement. The accessible use of applications is necessary to enhance the quality of life, especially in megacities (as cited in Nam and Pardo, 2011). Even in smaller cities, such as the Boise Smart City Initiative (2002) education renders the city more attractive. Businesses activity and organizations can develop dynamic learning environments (as cited in Nam and Pardo, 2011). Social interaction between communities within the city is also very important for the implementation of learning processes in order to support social innovation.

Indonesia is relatively new to smart city planning; therefore, smart city management is not yet focused on gender equality. Instead, it is focused on technology's capacity to close gaps between people's demands for city services and the capability of the service providers. Pesti et al (2017) studied the emergence of some local governments that have developed their districts as smart cities. For example, Bandung and Surabaya have developed their information and technology to include public services, apparatus performance, citizen interaction, and open data. In Surabaya city the e-Government concept also covers the Innovation of Electronic Regional Development and Community Services. Canares et al. (2017) has argued that there remain challenges in Jakarta's inclusion of these applications because they depend on access to smartphone technology. There are also concerns that the government has not been 'marketing' the Jakarta Smart City initiative sufficiently to attract widespread adoption. Local leaders have an important role to play in encouraging the use of technology for the ease of society (Mahesa *et al*, 2019).

Smart city theories recognize the significance of gender equality and empowerment for women and girls and the centrality of the SDGs in achieving these goals. The results of this study indicate that it is necessary to consider the different perspectives in planning and management phases to achieve social justice for all communities using gender responsive approaches. Social innovation in smart cities requires an understanding of technology users through community empowerment, especially for women, to solve the challenges of women's participation to access and use. The ways to improve women's access and participation are through support for women's participation and improving women's leadership in urban governance and community development. Moreover, technology applications must be developed with a gender-sensitive perspective and collaboration among stakeholders, including implementing a gender approach to environmental management education (Asteria *et al* 2018). Figure 6 shows the relationship between a gender responsive approach and social innovation in relation to smart city planning and management.

Figure 6. Framework of gender responsive approach in smart city planning



In Figure 6 above, the human aspect category includes raising creativity, social learning, and education for citizens. Ideally, the smart city is a center of higher education and a smart workforce. Exploring creative capabilities and human skills is very important for smart city management (Malek, 2009). The government should integrate IT system and data quality to gain effective and efficient smart city management, especially for citizens through geospatial data (Axellson et al., 2013). The government must have the capacity to encapsulate and evaluate mechanism of collaboration, cooperation, partnership, citizens' engagement, and citizens' participation. These conditions have to be supported by good leadership in order to achieve successful smart city across services in their planning and implementation.

Therefore, we recommend increasing women's roles in environmental conservation programs as one pathway to include women in the planning of sustainable smart cities. In terms of further research, we recommend further studies through a qualitative lens that uses in-depth interview techniques to explore women's knowledge and experiences in the use of technology for smart cities. Furthermore, governments should implement collaborations between stakeholders in the smart city and demonstrate their support for social innovations by collaborating with academics and implementing organizations.

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