The Transformation of Smart City Concept in Urban Development (Case Study: Semarang City)

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Abstract. The urban development in line with technology growth has created a smart city concept. Semarang city is one of the metropolitan cities that has applied a smart city concept since 2013 by implementing information technology in their programs. It was successfully made Semarang getting an award as the best city of Development Regional Awards by Bappenas (Ministry of National Development Planning) in 2019. But over time, the smart city concept in Semarang has transformed in its implementation to solve the city's problems and adapt to their needs. The purpose of this study is to describe the phenomena in the transformation of the smart city concept in urban development with case study of Semarang city. This study uses an abductive approach by the methodology of case study that armed with a few of theory and has a lot of exploration about the phenomena. The results of this study indicate that the transformation of the smart city concept in Semarang affected by several factors in urban and regional development, which consist of internal and external factors.

1. Introduction

Problems in urban development arise along with the level of urbanization from rural to urban areas. Globally, 55% of the world's population lives in urban areas in 2018. By 2050, it is predicted that 68% of the world's population will live in cities [1]. Issues such as limited land, socio-economic, environmental degradation, health, transportation, disaster and even public services will become serious problems for cities, while urban communities which are increasingly modern and established expecting a comfortable living and working environment, adequate public areas, and the ease of taking care everything [2]. To address urbanization and ensure the quality of life for citizens, many cities are now focusing on finding development solutions through the application of technology, community involvement, and transparency [3].

The technology growth has an impact on urban development in dealing with developmental problems. Technology will accelerate the growth of cities in terms of infrastructure, transportation, energy supply, and administration enabling them increasingly effective and efficient. It also helps cities dealing with various urban problems, such as traffic jams, floods, environmental degradation, crime, and also poverty. Technological growth greatly affects the development of a city/region, including the process of development towards a smart city. According to Deakin and Allwinkle (2007), the stages of digital technology growth which usually happen in urban development shown in Figure 1 [4].
The concept of a smart city is widely adopted by cities in the world including Indonesia. The development of urban/regional areas towards a smart city is a transformation process from traditional management to becoming smart management [5]. While technology is one of the important factors to realize the smart city concept, comprehensively there are other affected factors such as institutional and human factors [6]. Government is one of the institutional factors leading in managing cities towards the implementation of smart city concepts. Because a government formulates a development planning policies related to political interest in government management systems, therefore the achievement of the plan implementation becomes feedbacks for the future planning agenda [7].

Applications of the smart city concept in urban development utilize information and communication technology (ICT) to optimize existing resources, improve city services efficiently and effectively, and increase the city competitiveness. The concept of a smart city is the result of the development of intensive knowledge and creative strategies in improving the quality of the socio-economic, ecological, and competitive power of the city [8]. The process of transition toward a smart city requires collaboration both internal and external actors, to achieve mutual satisfaction and prosperity. The initial stage is an important part in determining the success of smart city implementation for its long-term process. Bouskela et.al. (2016) described the process of traveling toward the smart city can be seen in Figure 2 [9].

The Central Government, through the Ministry of Communication and Information, launched Movement towards 100 Smart Cities as an initiative to develop cities and regencies implementing smart city concepts [10]. Some of the major cities in Indonesia such as Surabaya, Jakarta, and Bandung, followed by other cities, including Semarang, had participated in the movement implementing the concept of smart city. But each city/region had its own and unique transformation process to implement the smart city concept for answering the urban development challenges, so did Semarang. Semarang is the capital city of Central Java Province and the fifth largest city in Indonesia after Jakarta, Surabaya, Medan, and Bandung. As a trading city, Semarang has implemented the concept of smart city since 2013 which began with digital government services (e-government). The stages of Semarang city toward smart city can be illustrated in Figure 3.
The study of the transformation towards smart city is still developing and there is no consistent concept of smart city transformational development. So, this research aims to describe how and why the transformation of smart city concept implementation in the process of urban development to face their problems. This path leads to the transformation process towards smart city and the factors that affected, with the case study of Semarang city as a trading city that participated in the Movement towards 100 Smart Cities in Indonesia. Therefore, the research questions in this study were (1) how the transformation of smart city concept in urban development was implemented in Semarang? and (2) what factors affected the transformation process? While the research objectives were (1) to describe the transformation process of smart city concept with the case study of Semarang city, and (2) to identify factors affected the transformation process.

According to the technological growth and the process of transition towards smart city, the theoretical framework of this study can be illustrated in Figure 4. The framework functions as the theoretical preposition for this case study research.

2. Materials and Methods
This research employed an abductive qualitative approach, while it used a case study method which is an approach armed with a little theory and builds more theory from cases in the field [12]. According to Yin, 1996, to answer the research question "how, why" is more suitable to use the case study method [13]. In qualitative research, qualitative methodology as a research procedure that produces descriptive data in the form of written or oral words from people and observable behavior [14].

Two types of data collection were employed in this research: primary and secondary data collection. Primary data acquisition in this method was done by in-depth interview and field observation, while secondary data is obtained in the forms of planning and evaluation documents, such as Regional Medium-Term Development Plan (RPJMD), a smart city master plan, an urban spatial plan, strategic plans, performance reports, and Accountability Report (LKPJ), as described in Table 1.

| No | Primary Data | Secondary Data |
|----|--------------|----------------|
| 1  | Process towards smart city | RTRW, RKPD, RPJMD, Master Plan |
| 2  | Masterplan of smart city concept | Semarang Smart city, Laki/p LKPJ |
| 3  | Dimension of Smart City | Mayor of Semarang city, Bappeda and Diskominfo, Accountability Report |
| 4  | E-Government | (http://smartcity.semarangkota.go.id/) |

Table 1. Description of the received data (primary data and secondary data)
The collected data and information were put in timeline (chronological) order. Based on the timeline, the researcher conducted periodization (data sequence analysis)—resulting in three periods towards smart city development in Semarang. The other two types of analyses were conducted, namely: “within period analysis”, and “cross-period analysis”. The purpose of within period analysis is to describe the development of each period and identify factors that work on the development period. As all development periods had been analyzed, the researcher conducted a cross-period analysis in order to identify factors affected the smart city development along all periods, in the case study of Semarang city.

3. Results and Discussion

3.1. Periodization Result

The transformation of the smart city development in the case study of Semarang city takes place over time and adjusts to the city’s conditions. The result of the transformation process toward smart city concept by time series analysis (periodization) as shown in Figure 5.

![Figure 5. Transformation of Semarang Smart City Concept](image)

| Period | Description |
|--------|-------------|
| Before 2013 | E-Government: Operation of Information and Communication Technology in Semarang City. |
| 2013-2017 | Towards Smart City: Implementation of Smart City Concept. |
| After 2017 | Smart City: IT and Non IT. |

3.1.1. First Period: E-Government (before 2013)

E-Government implementation program was the embryo to implement the smart city concept where the Semarang City Government had transformed using of information technology. The use of information and communication technology in developing Semarang’s public services continued to be carried out with initial guidance through the ICT Master Plan (2010-2015). The development of Digital Government Services has occurred during the mayor's turnover which triggered the start of Semarang city towards Smart City (2013). The Semarang City Government employed the advances of information technology to support the implementation of good governance in order to improve the quality of public services becoming more effective and efficient. This period was the initial stage of digital technology development in Semarang city that all the public information provided via cities’ websites.

3.1.2. Second Period: Toward Smart City (2013-2017)

During the period of 2013-2017, Semarang City Government carried out "cyber governance", namely the internal development of the government and the infrastructure network of all regional apparatus organizations. One example was the strengthening of data centers where all servers were centralized and all hosting and domain applications use the web domain of semarangkota.go.id. To develop the city toward the implementation of smart city concept, the Semarang City Government established cooperation with various parties, which is called "Pentahelix" as the next step in the form of ABCGM collaboration efforts (academic, business, community, government, and media). In the process of internal strengthening of the government, various comprehensive studies were carried out in the current condition of Semarang city in facing future city challenges.

During this period of Semarang city towards Smart City implementation, the definition of smart city discussed was about the development of information technology applications. Many web-based applications and websites have been developed in each of the regional apparatus organizations, but they
were not interconnected with each other. In fact, there was a waste of effort at that time. Therefore, the next new effort carried out in the development of internal governance was the development of cyber governance as the integration of web-based applications and websites among regional apparatus organizations. Furthermore, external development (namely: cyber society) also carried out by involving the role of stakeholders, especially to socialize and educate the communities through media.

Semarang city was nominated in 25 cities in the Movement towards 100 Smart City Program by the Ministry of Communication and Information. This program was one of the triggers affected Semarang City Government in developing the city towards a smart city. Semarang City Government also received guidance and knowledge related to the implementation of smart city concept from the Ministry of Communication and Information and also assisted by a faculty member of the Bandung Institute of Technology. Various efforts were made by city government to implement the programs and to create innovations employing information technology. This second period was the middle of the way towards the transformation of Semarang city in implementing smart city concept.

3.1.3. Third Period: Smart City ≠ ICT (after 2017)

The third period was the realization of implementation and plans through innovative programs. At this stage, much of the city’s infrastructure development was carried out to meet the community’s needs for public facilities. This was one of the processes of "cyber society", namely external development to find out the problems and needs of the community. The city government realized that smart city was not only focused on the development of information technology, but also the community. The provision of various public service facilities could improve the welfare of the people of Semarang city.

If we only rely on information technology, it was not enough to solve various problems without understanding the community’s needs. According to the investigation and data analysis, most of Semarang citizens were complaining about the physical of urban infrastructure that needs to be improved. Thus, the Semarang City Government redefined the concept of smart city in urban development was not only about information technology development, but also non-technology for urban infrastructure development. After 2017, the transformation of the smart city concept implemented in Semarang city that information technology (ICT) was one of the tools to accelerate urban infrastructure development and speed up public services. The increasingly clear definition of the smart city concept was finally made in the Semarang Smart City Master Plan as a guideline for implementing government programs and innovations. It became Semarang Mayor's Regulation No. 26 of 2018 [15].

The transformation of smart city concept in Semarang successfully brought achievement and targets for city development. In 2018, Semarang city had received the highest number of Human Development Index in Central Java Province and exceed other major cities such as Surabaya and Bandung [16]. Besides, the city development concept of “working together” among all stakeholders brought Semarang City Government improved new achievements from various sectors and capable to win various awards. It made Semarang city becomes a great and better city.

Time after time Semarang city continues to show its development with various awards that have been achieved. In line with the technology growth, Semarang city is faster in carrying out the development city. In the nomination of ISNA (Indonesia Smart Nation Award) 2018, Semarang city was awarded as the Best Smart Economy and the Best Smart Living by implemented the smart city concept. And also, Semarang city has been named the Indonesian Best City in the 2019 Regional Development Award by the Ministry of National Development Planning. [17]

3.2. Factors Affecting Smart City Transformation

Based on the description of “how” Semarang city implemented the smart city concept, the researcher conducted two types of analyses (within-period analysis and cross-period analysis) to identify (internal and external) factors affecting the development of Semarang’s smart city as well as to identify actors (stakeholders) contributing to the development processes.

3.2.1. Internal and External Factors

According to the stages of Semarang city in transforming the city into a smart city, there were several factors influenced successfully in each stage, including internal and external factors. The internal factors
that leading the transformation process were mayor’s leadership, human resources, integrated system, and regulation. The strongest encouragement factor was the city mayor's leadership ability to embrace all stakeholders for supporting each other. In strengthening the internal government, the entire regional apparatus organizations needed to be qualified and competent human resources and also had an integrated system to overcome various urban challenges in the future. Besides that, the smart city master plan has supported as regulation for implementing the smart city concept.

The external factors outside of the city government were citizen participation, all of the stakeholders, and central government support. The citizen participation needed to give feedback to the city government in monitoring and evaluation. Then, all stakeholders did their role to support each other. While support from the central government such as funding and technical assistance was given for a better understanding of the smart city concept.

3.2.2. Relation among Stakeholders

The various awards achieved by the Semarang City Government cannot be separated from the role of all stakeholders, both the government, entrepreneurs, citizens, and reporters (4P: pemerintah, pengusaha, penduduk, dan pewarta). The city government has a role to provide services to the community optimally and resolve various urban problems through innovative programs. The entrepreneur was supporting in collaboration and cooperation with government programs, such as Corporate Social Responsibility (CSR). While the citizen’s role was participating actively to obey the regulation. Then, the reporters had an important role in city branding (smart branding) and socialization the government programs to engage the citizens' participation.

4. Conclusions and Recommendation

This research found that technological growth greatly affects the development of urban/region, which also affects the process of city development towards smart city. For the case study of Semarang city that has been developing information technology is not enough to solve various urban problems rely on technology, but also requires the support of non-IT such as funding, the participation of all stakeholders, and its implementation in the real field. Over the time and process, there was a transformation of the smart city concept in Semarang city. How the transformation of smart city concept in urban development shows the effects of several factors that bring different stages towards smart city implementations to face the urban challenges.

It is recommended that each city government needs to implement smart city concept in urban development in order to accelerate the achievement of development plan targets and brings more prosperous city conditions than before. For further investigation of this study can be developed to categorize (e.g. slow, medium, and fast) the transformation process toward smart city. Since each city has its own and unique transformation process to implement the smart city concept, the researcher also recommends to furthering research to other cases of Indonesian smart cities.

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