COMPARISON OF TECHNOLOGY, HUMAN RESOURCES, AND INSTITUTIONAL RESOURCES PERSPECTIVES: CASES OF JAKARTA SMART CITY

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Abstract. Smart City policy is the right choice for cities to transform to be more dynamic by keeping up with the development of social, economic, and globalization. Governments in big cities such as Jakarta have formulated and implemented smart city policy with various objectives. The government of Jakarta city built smart cities to maximize public services, provide solutions for city problems and support sustainable development. This research aims to describe the implementation of smart cities in Jakarta City from the perspectives of technology, human resources, and institutions. This study will also portray the use of big data in Jakarta smart city. These three factors are determinants of achieving the visions of a smart city, which are smart energy, smart transportation, smart environment, smart health care, smart education, smart safety, and other policy domains. The research method used descriptive qualitative method with data sources derived from secondary data sources such as data obtained from official sites, related documents both sourced from the government and the public, news, research results, and others. The result of this study is expected to provide recommendations and solutions for the city government in solving problems and obstacles faced in the implementation of strategies in achieving the vision of the smart city.

Keywords: smart city, public policy, policy implementation, policy comparison, technology, human resources, institutional resources

1. Introduction

Indonesian population in 2019, according to the data is projected at about 270.6 million. From that number, around 150.9 of the people or its 55.8% live in the city. This number rose as much as 0.7 percent from the previous year of 147.6 million people. These data show that people who live in the city are now bigger than people who live in the village.

Many things motivate Indonesian residents to migrate from village to town. The main factor is the economic factor, that is to get a better living [1]. Other factors are the low nature growth in the city, the slow motion of status leverage in the rural area to be an urban area, and government policy that is still “urban bias” in imposing economy and development policy [2]. Another factor is the problems that showed up as an effect of regional disparity, due to development.

In line with the increasing number of urban residents, urban areas face more complex problems. Cities around the world are challenged to handle problems, i.e. air pollution, waste management, traffic congestion, and poverty [3]. To handle the problems, scholars and city planners around the world propose a smart handling process, based on efficiency, effectiveness, productivity, transparency, and sustainability [4]. This phenomenon is mostly known as a smart city. A smart city has been developed aggressively in the last decades around the globe as 1000 cities started the development of smart cities by 2017 [5]. Since most world's population live in cities and there are huge challenges that cities' governments need to overcome, such as traffic jams, green issue, and some global problems. This is what causes smart city becomes an emerging domain of study [6].

The smart city utilized the use of smart computation technology to integrate main components of city service and infrastructures, such as education, health, public safety, real estate, transportation, and other city daily needs, efficiently and intelligently [7].

The study regarding the smart city in Indonesia mostly discusses technology and ICT implementation. For example, the effectiveness of Jakarta Smart City from the perspectives of
the Technology Acceptance Model (TAM) [8], and the implementation of Jakarta Smart City from the perspective of six smart city dimensions [9], and the implementation of Smart City by using Development of Smart Public Transportation System in Jakarta City based on Integrated IoT Platform [10].

According to six characteristics of the smart city proposed by Giffinger, et al., there are the smart economy, smart people, smart governance, smart mobility, smart governance, smart environment, and smart living, there are concerns of a smart city to also engage people and improve governance business process [11]. In other words, the implementation of the smart city must also look into the people and institutional aspects, to achieve a sustainable society and region. For that purpose, Nam and Pardo compressed the six concepts of the smart city into three perspectives, such as technical factors, institutional factors, and human factors [12]. Also, smart city has been linked closely to the use of big data, as mentioned in the study of Al Nuaimi et al [13] and Hashem et al [14]. Some big smart cities as Hongkong, London, and New York have been implementing the use of big data in some city life aspect, such as transportation and public health monitoring. Big data is certainly enriching people's experiences of how cities function, and it is offering many new opportunities for social interaction and more informed decision-making concerning knowledge of how best to interact in cities [15]. Moreover, big data offer the potential for cities to obtain valuable insights from a large amount of data collected through various sources [14].

Therefore, a study regarding the implementation of smart city by employing the three perspectives of Nam and Pardo [12] is needed to be concluded, to assess how technology, institutional, and human factors. It is also urgent to find out whether Jakarta smart city uses big data in their city planning and management. By providing an overview of the implementation of big data in Jakarta smart city, it is easier to find out real condition so it may give an understanding of what the smart cities need to improve in terms of technology, human resources, and institutional factors.

2. Literature Review

The concept of a Smart City is widely discussed with a multidisciplinary approach. In other words, there are many fields of study that try to portray the concept and the practice of smart city in real life, such as Information Technology, Public Administration, Economy, Architecture, etc. The smart city emerges with the existence of a set of problems faced by cities and megacities around the world. A smart city is seen as a solution for big cities to solve technical, physical, material, social and organizational problems by addressing the smarter and easier way to manage them [16]. This idea is in line with Tranos and Gertner’s that the smart city approach is emerging as a way to solve tangled and wicked problems inherited in rapid urbanization [17].

Smart cities are the realization of digital city development based on ICT infrastructure and employ Big Data, IoT, and cloud computing [18]. In the planning and building smart city, it is important to consider the use of big data since big data is useful and applicable for long-term smart city sustainability. Big Data technology plays a very vital role in the development of a Smart City. Given a huge amount of data from many sectors to proceed, it needs a sophisticated technology to analyze, integrate, and work in real-time. Those data will become the basis to take specific strategic actions and to continue the decision-making process, such as allocating appropriate subsidy for the people and providing social security network for the society [19]. In the transportation sector, the application of this data processing technology may help people to get information regarding the condition and location of public transportation they need [20].

However, Hall, et al., also propose some disadvantages of applying a smart city strategy to an existing city like the complex ecosystems of people, institutions and stakeholders require extreme effort to organize and discipline [21]. It could be added that an existing city’s infrastructure could be old and outmoded, hindering the realization of the smart city vision and besides becoming ‘smart’, existing cities have many problems that must be addressed and which compete for a share of the city’s recourses. Therefore, it is argued that it is impossible to address all aspects of a smart city; the strategy must be highly selective and based on a laborious
prioritization process. Seeing those challenges, cities must be well prepared in planning smart city policy.

3. Research Methodology

This study applies descriptive qualitative study by analyzing previous literature and official documents related to the implementation of smart city policy in Jakarta. The first step to do is collecting all references relevant to the topic from various sources: mass media, official documents, news, previous researches, journals. The data are being gathered, classified, and analyzed to get a view on how the policy of smart city is being implemented in Jakarta from the perspective of technology, human resources, and institution.

4. Results Of The Research

4.1 Smart City Implementation In Jakarta

As the biggest city in Indonesia, Jakarta has faced many problems, such as floods, traffic jams, pollution, poverty, land degradation, and social conflicts. In 2020, it is estimated that around 10.57 million people dwell in Jakarta [22]. As stated on Regional Regulation Number 2 of 2013 about Middle Term Regional Development Plan 2013-2017, the vision of the Special Capital Region of Jakarta is “a new Jakarta, a neat modern city, to be a decent and humane dwelling, have a culture of society and a government that is oriented towards public services” [23]. In implementing the smart city, DKI Jakarta designed the strategy of vision, strategic target, mission, and basic principles below. Based on three factors of the smart city proposed by [24], the following section describe the use of technological, human, and institutional factors in Jakarta Smart City.

4.2 Technological Factors

There are many working definitions of a smart city that stresses the use of technology. R. Hall stated a smart city as a “city that monitors and integrates conditions of all of its critical infrastructures.” A city that can monitor and integrates conditions of all of its main utilities need high technology and well-organized institutions. IBM gives a view regarding the smart city as a city with three main characteristics, which are instrumented, interconnected, and intelligent. Instrumentation is a process of gathering real-time data from the real environment [25]. The data will then be interconnected across multiple processes, institutions, industries, or value chains. These instrumented and interconnected systems will deliver the physical world to the virtual world successfully and will be deemed as an intelligent system. In realizing this instrumented, interconnected, and intelligent city, DKI Jakarta made several efforts in providing the city with smart system information.

4.2.1 Disaster Information Management System

To cope with floods and disasters, DKI Jakarta has successfully implemented several innovations in a big frame of smart city, like the Disaster Information Management System (DIMS), a closed system developed by Fujitsu to report the river water level. Citizen is also involved in the system by giving feedback and information regarding the disaster, through Pasang Mata and Qlue application. Twitter is also utilized to gather data on flood levels in all Jakarta areas [26].

4.2.2 Pasangmata

Pasangmata.com or Pasangmata app is a citizen media, provided by detik.com portal news, to contribute an event through articles, photos, or videos. Pasang Mata allows internet citizens to report problems regarding deteriorated public facilities, traffic congestion, garbage disposal, etc. This app is developed by the private sector to support the implementation of Smart City, including Jakarta.

4.2.3 Jaki (Jakarta Kini)

Jaki is the main platform for Jakarta Smart City. Jaki provides varieties of legal information and service from the government of Jakarta Special Region in just one app. Jaki has become an integrated portal of all public institutions in DKI Jakarta. It also allows the citizen to report city problems. Jaki consists of several features including JakLapor, JakPangan,
4.2.4 Trafii

Trafii is an application to provide public transportation information. This app has become an official Jakarta Smart City app partner and official TransJakarta supporting the application. Through this partnership, the citizen can identify the schedule and estimation of TransJakarta in real-time. Trafii also provides other public transportation information in Jakarta, such as Commuterline, Jakarta MRT, and Jakarta LRT. Trafii also collaborates with Jakarta Smart City in implementing data sharing, to be used to analyze the transportation usage, as a plan and policy development in advance [27].

4.2.5 People Factor

The people factor is also a formidable aspect of smart city implementation. As inferred in Technology Acceptance Model (TAM), perceived ease of use is one of the factors that determine a successful operation of an information system. People in South Jakarta are helped by the ease of complaint system of Jakarta Smart City. The human factor highlights the use of public resources to treat people as citizens properly and conveniently.

4.2.6 Bus Rapid Transit (Transjakarta)

Transjakarta is the first Bus Rapid Transit System in Southeast and South Asia since the 15th of January, 2004 in Jakarta, Indonesia. TransJakarta was designed as a transportation mode to support the very heavy Special Capital Region of Jakarta activity. With the longest track lane in the world (251.2 km) and 260 bus shelters, spread over 13 corridors, TransJakarta is fully operated 24 hours a day. People in Jakarta rely heavily on TransJakarta because it eases people’s need to move from one place to another place fast and without trapped in traffic congestion. Transjakarta has its lane on most of Jakarta's main highways and it transits rapidly so that people can choose where they want to get started and finish, to reach their nearest destination.

4.2.7 Mass Rapid Transit

The Jakarta Mass Rapid Transit or Jakarta MRT is a rapid transit system in Jakarta. The MRT Jakarta is operated by PT MRT Jakarta, a municipally owned enterprise of Jakarta. Phase 1 of MRT Jakarta has been operating since 24 March of 2019. It spans 15.7 kilometers and it has 13 stations. The daily passengers of MRT are 93,000 passengers a day.

4.2.8 Light Rapid Transit

Jakarta Light Rapid Transit is a train metro system in Jakarta with fewer capabilities than the MRT Jakarta. The first phase of the LRT, from Velodrome to Pegangsaan Dua began commercial operations on 1 December 2019, with operating hours from 05.30 A.M. to 11.00 P.M. It spans 5.8 kilometers with six stations stretch along the route. The development of the Jakarta LRT is aimed to handle road traffic congestion. Each trainset consists of two cars only and able to carry 270-278 passengers with a total of 16 cars. The train fare is set at Rp.5,000 for a one-way trip without the limited distance. Passengers can purchase a ticket at the ticket booth or the Ticket Vending Machine (TVM).

4.2.9 Commuter Line Train

Commuter Line is the most favorable transportation mode for most daily Jakarta workers. Commuter Line is an electric-powered train that serves passengers throughout DKI Jakarta and its satellite cities (Bogor, Depok, Tangerang, Tangerang Selatan, and Bekasi). The commuter line is operated by PT KCI. It has a 1.100 commuter line unit and will keep on rising. In 2019 alone, daily commuter line passengers are 979,853 users in workdays. PT KCI serves 80 train stations throughout Jabodetabek, Banten, and Cikarang with routes span of 418.5 km [29]. Commuter line becomes citizen’s most favorable transportation, due to its punctuality, speed, comfortable car, and affordable price.

4.2.10 Bike Sharing and Bike Lane

Bike sharing is a bike provision system in public places that can be utilized for free by the citizen. Bike-sharing has been popular in the big cities, such as London, Washington DC, Mexico City, Guangzhou, and others. Up to now, Bike sharing is spread on 9 spots in Jakarta, with 200 bikes provided, from 06.00 am to 06.00 p.m. those 9 spots are: Bundaran HI MRT Station, Halte Bus Pelican Crossing Bundaran HI east side, Halte Bus Pelican Crossing Bundaran HI west side, in front of Sinar Mas building, south side of City Hall bus stop, Tanah
Abang Station, and Central Jakarta Major Building, Abdul Muis Technical Institution Building, and Abdul Muis Technical Institution Building. The tariff is Rp3,000 per use. Before using the bike, citizens have to download the GoWes application in Appstore and Playstore first.

4.2.11 Smart Cards

Jakarta Cards is an assistance program to support low-income citizen in Jakarta. It was first launched by governor Joko Widodo in 2014. In Anies Baswedan’s administration, the Jakarta Cards consist of Kartu Jakarta Pintar Plus for education, Kartu Jakarta Mahasiswa Unggul (KJMU) for college students, Kartu Pekerja Jakarta (KPJ) for labors, Kartu Penyandang Disabilitas Jakarta (KPDJ), Kartu Jakarta Sehat for health provision, Kartu Lansia Jakarta (KLI), and Kartu Bantuan Sosial DKI for social assistance program. These cards are very helpful to support the people in maintaining a healthy and proper living.

4.3 Institution Factors

4.3.1 Jakarta Satu Data Policy

To implement a good governance process in DKI Jakarta, the government of DKI Jakarta launched an integrated map system and data in the Jakarta Satu program. The Jakarta Satu program is one of the tools for Decision Support System, due to its high-integrity data basis. All the institutions in the DKI Jakarta government are obliged to implement all of the data and map integration phases in Jakarta Satu Program as the DKI Jakarta government priority program, coordinate and working together with all of the DKI Jakarta management in realizing the implementation of Jakarta Satu Program. The Jakarta Satu Data map can be accessed via jakartasatu.jakarta.go.id website and Jakarta Satu app.

4.3.2 DPMPTSP

Office of Investment and Integrated Service One Door (DPMPTSP) of DKI Jakarta is a regional agency that gives government service in investment and licensing/non-licensing service in the DKI Jakarta area. Several innovations are made by the DPMPTSP of DKI Jakarta, like pick-up licensing documents, online licensing services, public service mall, and “Do the License by Your Own is Easy” which is widely known by the DKI Jakarta citizen.

4.3.3 Jakarta Smart City Website and Application

DKI Jakarta Government has an official website and app, on the website smartcity.jakarta.go.id and Jakarta Smart City App. These platforms provide various information regarding Jakarta Smart City, such as Jakarta Smart City vision, mission, and also newest updates on Jakarta Smart City from the perspectives of smart living, smart mobility, smart governance, smart environment, smart economy, and smart people.

From the perspective of the institution, it is inferred that the government has given support to the Jakarta Smart City. The whole government paradigm has been applied in the implementation of the Jakarta Satu Data policy. However, the effort of the government to realize the Jakarta Smart City is still lack socialization and campaign.

5. Conclusion And Recommendation

This paper aims to identify the implementation of Smart City in Jakarta from the perspectives of technology, human, and institutions and give an overview on the implementation of Big Data in those two cities. It is very important to assess smart city from perspectives of human and institutions, besides of technology, because smart city assures that human is treated as a human being and the city is sustainable in terms of environmental, economy, and social culture.

In Jakarta, the Jakarta Smart City has reached into a sophisticated, collaborated, and interconnected ICT with private and social, to simultaneously report and monitor the city’s condition. The human factor is still the priority for the Government of DKI Jakarta, as they give many assistance programs for low-income society and provide the best public facilities for residents and workers who commute in Jakarta daily. The institution of DKI Jakarta Government has also put forward the commitment to support the Jakarta Smart City, but they are lack socialization and campaign for the citizens.
We recommend that the government of DKI Jakarta has to promote the Smart City platform more than before. Big data should be a thing to consider during city planning and development, so there will be a simultaneous improvement on smart city quality. Jakarta smart city needs to consider cooperating with the third party to help them improve and update their technical quality and human resource capabilities in planning and managing a smart city. It is also recommended that interagency cooperation is upheld to ensure program sustainability and good coordination among agencies in charge of smart city implementation.

For further research, it is recommended to conduct a study about the policy-making process of Jakarta smart city policy to improve understanding about the problems and implementation of Further study is also needed to discuss the implementation of big data in Jakarta city.

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