

DEVELOPMENT OF SMART GOVERNANCE MEASUREMENT FRAMEWORK TO CREATE A SUSTAINABLE BANDUNG SMART CITY

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Abstract

This study aims to examine the development of a Smart Governance measurement framework to create a sustainable Bandung Smart City. The measurement of Smart Governance identifies the potential of Bandung city and analyzes what indicators play a major role in the dimensions of Smart Governance, as well as implying government policy as a bridge between the community and the government in making decisions. This research uses Mixed Method (Quantitative and Qualitative). The data were processed using SPSS 25 and LISREL 8.80 app, with Structural Equation Modeling (SEM), the testing based on Confirmatory Factor Analysis (CFA) theory, which is used to support quantitative data. For qualitative data, researchers conducted interviews with stakeholders who were directly involved in the development of Bandung Smart City. The Smart City variable from the Smart Governance Dimension has 4 Sub-dimensions which have standardizes factor loading which explains that all sub-dimensions are meaningful and significant to the Smart Governance Dimension namely Leadership Stakeholders: Mayor, Deputy Mayor, and OPD of (0.83) , Governance Transparency (0.97), Community participation in decision making (0.59), and Infrastructure (0.94). Where the value of CR (0.91), and AVE (0.72). For further research, it is recommended to examine a broader dimension of Smart City, which include Smart Economy, Smart People, Smart Mobility, Smart Environment, Smart Living, Smart Branding, Smart Energy, Smart Society, along with other stakeholders such as relevant government agencies, colleges, entrepreneurs, medical teams and others.

Keywords: *Sustainable Smart City, Bandung City, Mixed Method, Structural Equation Modeling.*

INTRODUCTION

Significant developments that occur in an urban area has encouraged urban planning experts to solve problems that exist in the city. The growing economy and industrial sector place the world's big cities in the face of many challenges, starting with the problem of increasing urban population, rapidly growing urbanization, and other problems such as transportation, congestion, crime, waste, health and others.

The people's desire to form a livable city in terms of balancing population growth also supports the realization of the concept of a future city called Smart City. Smart City is a concept that is considered capable and suitable to answer this challenge.

Based on the Intercensus Population Survey Report (Central Bureau of Statistics, 2015). The results of SUPAS (2015), the population growth rate in cities across Indonesia is projected to increase to 82.37% in 2045 compared to 2015 which was 59.35% (Figure 1).

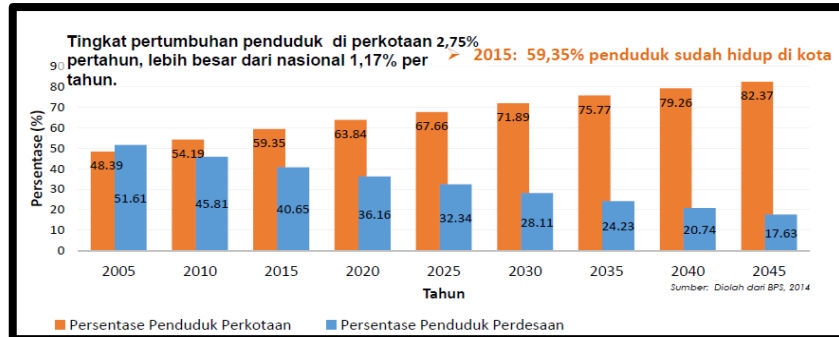


Figure 1. Illustration of National Population Growth Rate 2005-2045

Source: Ministry of PPN/ BAPPENAS, 2015

The city of Bandung has a population of more than 2.5 million people (Bandung Central Statistics Agency, 2020) and a population density of nearly 15 thousand inhabitants per square kilometer, of course, making the city of Bandung need to continue to strive to be responsive in solving problems that arise for the sake of creating a safe and comfortable urban environment for all residents of Bandung.

Mayor Ridwan Kamil's administrations has pioneered the Smart City concept since 2014. From 2015 to 2021, the city of Bandung has been named as one of the Smart Cities in Indonesia by the Indonesian Smart City Rating (RKCI). In addition to receiving many awards, the city of Bandung has also been used as a role model for other cities in Indonesia. Many efforts have been made by the government of Bandung in creating and maintaining a Smart City. The breakthrough made by the city in 2014 was to create the Bandung Command Center which later became a model for other cities to adapt the program.

The Smart City concept is one of the concepts to create a sustainable city. A sustainable city is how a city utilizes natural resources that exist all around us, which can also be utilized by the world population today and generations to come. Sustainability itself is a measurable process, which can be seen from how we implement the efficiency and effectiveness of the sustainable development process which can be seen in smart cities around world. Bappenas has made a roadmap for urban development until the year of 2050. It is planned that all cities in Indonesia as smart cities to realize Sustainable City as the city of the future (Figure 2.)



Figure 2. 2050 Urban Development Roadmap

Source: BAPPENAS, 2015

LITERATURE REVIEW

The Main Theory and Supporting Theory of Smart City is Griffinger (2007) who mentions the 6 (six) dimensions in the Smart City concept (Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment, and Samar Living) which are the basis for implementing Smart City which is then used to calculate the Smart City index of 70 (seventy) European cities, while Boyd Cohen, a researcher and Professor who studies entrepreneurship, resource sustainability, and smart cities at the Universidad del Desarrollo located in Santiago, Chile, coined the diagram about smart cities. According to Cohen Boyd (2013), which uses a broad, integrated approach in increasing the efficiency of the operation of a city, improving the quality of life of its residents, and growing their regional economy.

The indicators used by Griffinger in the Smart Governance Dimension are Participation in Decision Making, Public and Social Service, Transparent Governance, and Political Strategies & Perspectives.

Meanwhile, Boyd Cohen uses the Smart Government Dimension through 3 Working Areas (Online Service, Infrastructure, and Open Government). Where Online Service has 2 indicators (Online Procedures, and Electronic Benefit Payments), Infrastructure has 4 indicators (Wi-Fi coverage, Broadband Coverage, Sensor Coverage, and Integrated Health + Safety Operations), and Open Government uses 3 indicators, namely Open Data, Open Apps, and Privacy.

This research combines the indicators of Griffinger, Boyd Cohen, and previous research. The development of the measurement framework for the Smart Governance dimension is divided into several sub-dimensions. The first sub-dimension is the Leadership Stakeholders Mayor, Deputy Mayor, and OPD, obtained from the research of Wenxuan Yu Dan Chengwei Xu (April 2018), which uses indicators of Government Leadership and Institutional Support. This indicator is the most important potential for Bandung because the Mayor and Deputy Mayor along with the OPD have a leadership style that is very supportive and has the knowledge to make Bandung a Smart City.

The second sub-dimension is Governance Transparency, based on Griffinger, with the Transparent Governance indicator, and Boyd Cohen, with the Open Government Working Area, using the Open Data indicator and Open Apps.

The third sub-dimension is Community participation in decision-making, obtained from Griffinger, namely the Participation in Decision-Making indicator. The fourth sub-dimension is Infrastructure, which is from Griffinger, with indicators of Public and Social Services. From Boyd Cohen, with Working Areas Online Services (Online Procedures, Electronic Benefits Payments), and Infrastructure (Wi-Fi Coverage, Broadband Coverage, and Sensor Coverage). Based on these findings, the authors chose 4 sub dimensions and 15 indicators. The following is Table 1, which are the dimensions and indicators used in this study.

Table 1. Research Dimensions and Indicators

DIMENSIONS	SUB DIMENSIONS	RESEARCH INDICATORS	CODE
SMART GOVERNANCE	Leadership Stakeholders: Mayor, Deputy Mayor, and OPD	1. Education level of Mayor and Deputy Mayor	SG1
		2. Support and Initiatives of the Mayor, and Deputy Mayor.	SG2
		3. Education level of the Head and Staff of OPD	SG3
		4. Support and Initiatives of the Head and Staff of OPD	SG4
	Governance Transparency	5. Legal protection for society	SG5
		6. Government that is open to information	SG6
	Community participation in decision making.	7. Community involvement in decision-making forums.	SG7
	Infrastructure	8. Conditions and functions of Bandung Command center (BCC)	SG8
		9. Data Disclosure	SG9
		10. App Opening	SG10
		11. Free Wifi Coverage	SG11
		12. LAPOR App	SG12
		13. Bandung Smart Card (BSC)	SG13
		14. E-Parking Prepaid Card	SG14
		15. Taxes Online	SG15

Source: Author, 2022

RESEARCH METHODOLOGY**Research Method: Mixed Methods Research**

The research method used in this dissertation is the Mixed Method. This study uses a sequential mixed methods strategy (sequential mixed methods) and Sequential Explanatory

Design. This design is characterized by data collection and analysis of quantitative data, and is followed by collection and analysis of qualitative data that strengthens the results of quantitative research.

Method of Collecting Data

Data collection methods used in this study are primary and secondary data. Primary data were obtained from observations, questionnaires, and interviews with stakeholders. Secondary data collection is the collection of data that are indirect to the object of research but through research on related documents, both data from agencies and from literature studies (Singarimbun and Effendi, 1995).

Data Processing Methods and Development of Research Measurement Indicators

Structural Equation Modeling (SEM) with Measurement Model

It is namely the relationship (loading value) between the indicator and the construct (latent variable). SEM has a characteristic that is analytical technique to confirm rather than explain. The indicators in this research are reflective indicators, with the following characteristics: the direction of causality from latent variables to indicators, between indicators are expected to be correlated (instruments must have Consistency Reliability) and eliminating one indicator, it will not change the meaning of the measured variable and measurement error at the indicator level.

Development of Research Measurement Indicators

The SEM used in this study is a reflective model of latent variables which develop measurement indicators. SEM here uses the Confirmatory Factor Analysis (CFA) method, by testing First Order Confirmatory Factor Analysis and Second Order Confirmatory Factor Analysis. In First Order Confirmatory Factor Analysis, a latent variable is measured based on several indicators that can be measured directly, while in the Second Order CFA, latent variables are not measured directly through assessment indicators, but through other latent variables.

Research Sample

This sample is then also called the respondent. Respondents in this study were people who were determined through purposive sampling analysis techniques. This purposive sampling analysis technique aims to determine respondents based on the level of importance and influence. The respondents' requirements include people who frequently visit the research area, who have lived in the research area for at least 1 year, who understand the potentials and problems in the research area, and people who are involved in managing the research area administratively, both actively and passively.

Determination of Purposive Sampling for Stakeholders

A Mayor and Deputy Mayor must have a minimum education degree in bachelor degree and has extensive knowledge in the matter of Smart Cities and Sustainable Cities.

The Mayor and Deputy Mayor are directly involved in development planning as well as implementing operational activities in the Development of Bandung Smart City towards a Sustainable City, who also understand the policies or regulations related to the Development of Bandung Smart City.

The expertise that must be possessed by the Head of Communications and Informatics Department is to carry out regional government affairs in the field of information communication and public relations based on the principle of autonomy and assistance. And the Head of Women's Empowerment, Child Protection Department, and Community Empowerment has expertise in formulating and implementing policies in the field of women's empowerment and child protection. Another task is to carry out evaluation and reporting in the field of women's empowerment and child protection.

RESULTS AND DISCUSSIONS

Region Characteristics

As the capital city of West Java Province, Bandung has a strategic value to the surrounding areas because it is in a very strategic location for the national economy. The strategic position of the City of Bandung is also seen in Government Regulation Number 26 in the year 2008 concerning the National Spatial Planning (RTRWN), where Bandung is defined in the national urban system as part of the National Activity Center, namely the Greater Bandung Urban Area. In addition, Bandung City is also designated as the Mainstay Area of the Bandung Basin, which is an area that has national strategic value. Judging from the geological aspect, the soil condition of the city is mostly an alluvial layer resulting from the eruption of Mount Tangkuban Perahu.

The Potential of Bandung City as a Research Area for Smart Governance

The potential of Bandung City for Smart Governance in this study is the Leadership Stakeholders: Mayors, Deputy Mayors and OPD as measured by the Education Level of the Mayor and Deputy Mayor, Support and Initiatives of the Mayor and Deputy Mayor, Education Level of the Head and OPD Staff, Support and Initiatives of the Head and OPD staff.

Mayor H. Mochamad Ridwan Kamil has a bachelor's degree in architectural engineering of Bandung Institute of Technology and continued his master's degree at University of California, Berkeley. Ridwan Kamil continued his professional work as an architect in various companies in the United States. Previously, Ridwan Kamil started his career by working in The United States of America shortly after finishing his undergraduate study. As for Deputy Mayor H. Oded Muhammad Danial, he graduated from Pasundan University.

Ridwan Kamil revolutionized the communication between the government (OPD, head of subdistricts and villages) and the citizen so there are direct communication channels that can open at all times, which is through Twitter and Facebook. Establishing a Smart City scope which includes, among others, the fields of transportation, health, education, energy, e-government, traffic, e-payment, etc. Trained OPD heads and staff to be smarter and more

tech-oriented and initiated an open government. Cooperated with the private sector in providing fiber optic lines and internet bandwidth. Currently the network is connected to all OPD offices and several CCTV cameras belonging to the City Government.

For legal protection for the community, many regulations and laws are available for the welfare of the community. The government's condition is open to the information needed by the community through the Bandung service government official twitter as an open communication medium. The transparency of the government can also be seen from the condition how the government is being open to information (open data) needed by the community, such as information from PPID (Information and Documentation Management Officer).

App openness can be seen from several apps that have been implemented in Bandung. This is an advantage for the city to make it easier for people in their daily activities, such as the Bandung Open Apps Services which provides app support services for communications and transactions accessed via smart phones. Free Wi-Fi coverage with more than 5000 Bandung access points are champions in serving internet or Wi-Fi access in various places in the city. The LAPOR app, in the form of the lapor.ukp.go.id service, works as a medium for public reporting on government performances between Bandung government (including the mayor) and the citizens of Bandung.

Currently, the city's Transportation Services has installed 445 parking machines at 221 points around Bandung using e-Parking.

Meanwhile, Taxes Online already has information from @bppdkotabdg and sipp.bapenda.bandung.go.id.

Bandung has also created a city control center, namely the Bandung Command Center (BCC).

Analysis of Identification of Influential Indicators Based on Community Perceptions of Bandung City

A total of 381 respondents for this research consisted of 214 men and 167 women. The majority of respondents were over 40 years old (54%), with the majority having a undergraduate/diploma degree which is 48.8%. Most of the respondents lived Bandung for more than 10 years (54.1%). The type of work of the respondents is divided into 11 groups, the most of which are private employees which is 28.87%, university students (20.47%), and entrepreneurs (19.16%).

In this study, respondents' responses to research variables were through descriptive analysis of each indicator. Descriptive analysis was used to determine the characteristics of the respondents' responses to the variables used in the study. The statistical measures used in the descriptive statistical analysis of this study were Mean and Standard Deviation (SD). Shown below is Table 2. Value Range and Category of respondents' choices in the questionnaire, with a Likert Scale as follows:

Table 2. Range and Category Values

SCORE	RESPONSES
1	Strongly Disagree/ Very Bad
1,1 - 2	Disagree/ Bad
2,1 - 3	Agree/ Fine
3,1 - 4	Strongly Agree/ Very Good

The processed results with SPSS version 25, the average Smart City variable data on the Smart Governance dimensions of the 15 research indicators has a score of 3.39, which is in the very good/strongly agree category. This shows that in general, respondents perceive the Smart City dimension of Governance very well/strongly agree. The perception of respondents in perceiving Smart City, the highest Smart Governance dimension is in the statement of SG2, namely: "Strong support and initiatives owned by the Mayor and Deputy Mayor, can reflect the Development of Bandung Smart City", with an average score of 3.55 and SD score of 0.567. Indicators that have an average score of 3.49 are SG5 (Legal protection provided to regulate people's lives for the better), SG6 (State of the Government that is open to information needed by the community), and SG11 (Availability of Free Wi-Fi coverage by the Government). While the lowest average score is in the SG14 statement, namely: "E-Parking provided by the government is at least 500 parking machines in 250 points spread across the city, with the average score of 3.12 and SD of 0.663 is that E-Parking still needs to be increased both in number and benefits that can be felt by the community.

Instrument Validity and Reliability Test Results

In this study, researchers conducted two kinds of validity and reliability tests of research instruments. The first test of validity and reliability is carried out using SPSS version 25 software as an initial stage to find out and determine which indicators can be entered for the second stage of testing with LISREL 8.80 software. The results of testing the validity of the question items on the questionnaire for each variable with a value of Corrected Item Total Correlation or r value > 0.3 (Sugiyono, 2013). Or $r > 0.2$ (Nisfiannoor, 2013). If the value of $r > 0.3$, it means that the question item/indicator is valid.

After testing the validity using SPSS software version 25 for each instrument variable in this study, it was found that all indicators (SG1 - SG15) had a Validity Value > 0.3 , which ranged from 0.492 - 0.719, meaning that all indicators can be continued to the next stage.

First Order Confirmatory Factor Analysis

The first step in this approach is to re-specify a CFA (Confirmatory Factor Analysis) model. This CFA model is a measurement model that models the relationship between latent

variables and observed indicators (measured variables). The relationship is reflective, where the observed variables are a reflection of the related variables.

The CFA model is used to measure its suitability to the data. The final results of the CFA are obtained through the overall fit test of the model, analysis of the validity and reliability of the model. One way that can be done is by trimming the model, where the analysis of the validity of the measurement model is carried out by checking (a) whether the t-value of standardizes loading factor (λ) of the observed indicators in the model is < 1.96 . Next (b) standardizes loading factor (λ) of the observed variables in the model 0.07 or if we choose the suggestion of Igbaria et al., (1997) in Wijanto, 2008 0.50, if there are variables that do not meet both these conditions, it will be removed from the model. The process of assessing the CFA (Confirmatory Factor Analysis) model will be applied and explained in more detail which is as follows:

The latent variable of Smart Governance consists of 15 observed indicators, meeting the t-test value of $10.50 > 1.96$, where the estimated value is 0.30, meaning that the Dimension of Smart Governance is Significant in reflecting the Smart City Variable, thus in conclusion, the hypothesis is accepted.

Likewise, the variable is said to have good validity on the construct or latent variable if the Standardizes Loading Factor (SLF) is 0.70 or 0.50. Based on the values of the Standardizes Loading Factor, all indicators are above 0.50. This shows that all observed indicators SG1 – SG15 can be included in the next stage model analysis.

Furthermore, the reliability of the measurement model will be seen through the calculation of Construct Reliability (CR) and Average Variance Extracted (AVE). A latent variable is said to be reliable if CR is 0.70 and AVE is 0.5. The results of the CR and AVE calculations can be seen in Table 8 below.

The CR value of the latent variable of Smart Governance is greater than 0.70 which is 0.92 and the resulting AVE value is smaller than 0.50 which is 0.45. This illustrates that the latent variable Smart Governance is good enough to meet the reliability requirements.

Second Order Confirmatory Factor Analysis

The latent variable of Smart Governance consists of 4 latent sub-dimensions, namely: Leadership Stakeholders, Governance Transparency, Community Participation, and Infrastructure. Overall, the latent variables of Smart Governance consist of 15 observed indicators, as shown in Figure 3. below:

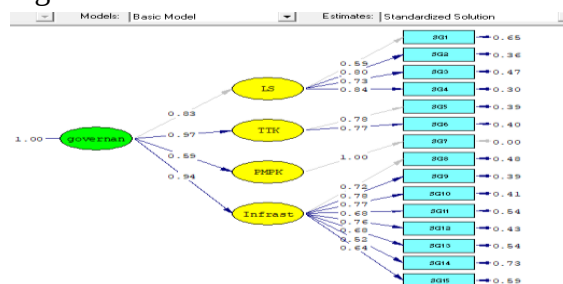


Figure 3. Smart Governance

Source: Processing Results with LISREL 8.80

The variable is said to have good validity on the construct or latent variable if the Standardizes Loading Factor (SLF) is 0.70 or 0.50. Based on the value of the Standardizes Loading Factor, all indicators value above 0.70, this shows that 4 sub latent dimensions, namely: Leadership Stakeholders, Governance Transparency, Community Participation, and Infrastructure and all observed indicators SG1 – SG15 can be included in the next stage of the model analysis.

Furthermore, the reliability of the measurement model will be seen through the calculation of Construct Reliability (CR) and Average Variance Extracted (AVE). A latent variable is said to be reliable if CR is 0.70 and AVE is 0.5. The CR value of the latent variable of Smart Governance is greater than 0.70 which is 0.91 and the resulting AVE value is greater than 0.50 which is 0.72. This illustrates that the latent variable of Smart Governance and its 4 sub-dimensions has met the reliability requirements very well.

The results obtained is that all manifests (dimensions and sub-dimensions) have a Standardized Loading Factor (SLF) of 0.50, thus all of the manifests forming the latent variables are significant, in other words it can be said that the manifests are meaningful and significant in forming the latent dimension. Therefore, all manifests in this study can be analyzed further because they can form latent variables.

The validity of the Governance Transparency sub-dimension is a sub-dimensional indicator with the largest Standardized Loading Factor with an estimated parameter of 0.97 in forming the Smart Governance dimension. Meanwhile, Community Participation is a sub-dimensional indicator with the smallest Standardized Loading Factor with an estimated parameter of 0.59. Construct Reliability and Average Variance Extract dimensions of the service delivery process are CR 0.70 and AVE 0.5, this indicates that the Smart Governance construct has good reliability. Thus, the sub-dimensions and indicators are significant in shaping the latent dimension of Smart Governance.

The Model Fit Index obtained are RMSEA, NFI, NNFI, CFI, IFI, and RFI, where all of these indices have met the Good Fit requirements.

Bandung City Government Policy Strategy to Accelerate Smart Governance Development

The existence of the data.bandung.go.id page is a form of transparency of the city's government in carrying out its main duties and functions. The obstacle experienced is ensuring the smart city concept is delivered to all communities. The policy of the city's government is to continue to synergize with the central government in developing human resources. Because smart cities are not only about developing technology but also how to turn people into smart citizens.

Since the implementation of Smart City in Bandung City, it has provided improvements for the implementation of the development process and also improvements in the midst of society. Changes after the implementation of Smart City in Bandung City are Faster Response Time, wider and easier services, more measurable performance, Clean & Government Transparency. Through open data, Bandung Champion and Bandung Smart City can be realized. Bandung's Communication and Information Office has also built an

Open Data portal, data.bandung.go.id, which provides various information needed by the citizen.

CONCLUSION

The city of Bandung has the potential for good governance so that it can make the city of Bandung a Smart city, with its staff who are also smart in managing the city for the convenience of its citizens in all aspects of life, and invites its citizens to become Smart Citizens.

The perception of Bandung citizens gave the highest score in SG2, namely the respondent's perception of the support and initiatives given by the Mayor and Deputy Mayor, followed by the legal protection indicator provided to regulate people's lives for the better, the condition of the government being open to information needed by the community, and Availability of Free Wi-Fi coverage by the Government. While the lowest average score is "E-Parking provided by the government and community's involvement in government decision-making forums such as in the political, economic, and social fields, projects, ICT, and planning. This lacking part needs to be improved to be able to provide better services to the community.

The strategy carried out by the city government has been good and has achieved many achievements, but it still needs to improve services to the community so that the governance of the can be felt by all people.

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