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Analysis of Citizens' Satisfaction and Participation Intention toward Citizen-centric Smart City Initiatives

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Analysis of citizens' satisfaction and participation intention toward citizen-centric smart city initiatives

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Abstract

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Frequently said for being too focused on the technological part, smart city approach implementation has shifted its objectives to put the citizens as the center of smart city's developments. The so-called citizen-centric smart city approach has two main characteristics, namely "*for the citizens*," which should meet the need of the citizens, and "*with the citizens*," which encourages the citizens to participate. However, previous studies showed that the current implementation of a smart city is often not in line with the actual need of the citizens. In addition, most prior studies only focus on the benefits of smart city initiatives and factors that affect the citizens to use the smart city initiatives. At the same time, only a few studies addressed the citizen's perspective of smart city initiatives and the relation to their intention to participate. Therefore, this study examines the citizens' satisfaction and analyzes its relationship with their participation intention toward citizen-centric smart city initiatives to fill in those gaps.

The data was collected through online questionnaires at the beginning of May 2021 with the target respondent of people living in Jakarta city. 187 data had been received from the survey. There were 9 data removed from the dataset during data cleansing and preparation due to the unengaged data with the same

value for all of the questions. Finally, a total of 178 valid data had been used in the analysis.

In the first part of the analysis, this study used the Importance and Performance Analysis (IPA) and Customer Satisfaction Index (CSI) to determine the level of citizen's satisfaction with the existing smart city initiatives in Jakarta. In the second part, this study implemented the Partial Least Square Structural Equation Modeling (PLS-SEM) to examine the relationship among predictors of the citizen's intention to participate in the smart city initiatives using Behavioral Reasoning Theory (BRT). The moderation effect of citizens' awareness had been discussed in the third analysis.

The result showed that the citizens' level of satisfaction is low satisfactory with 58.19%. In addition, the IPA analysis explained the perception of citizens toward each of the existing smart city initiatives and provided detailed findings for improvement and prioritization purposes.

The PLS-SEM analysis resulted that "*satisfaction"* strongly influences the "*reason for"* and "*participation intention*" through global motives "*attitude*". On the other hand, there is not enough evidence in this study that explained the relationship between "*reason against*" toward "*satisfaction*", "*attitude",* and "*participation intention*".

Lastly, the moderation analysis concluded that citizens' "*awareness"* strongly moderates the "*attitudes"* toward "*participation intention*" positively and the "*reason for"* toward "*participation intention*" negatively. On the other hand, citizens' awareness does not have any moderating effect on the "r*eason against*" toward "*participation intention*". Other findings, study implications, and limitations are also discussed in this study.

Keywords: Citizens' Satisfaction, Importance and Performance Analysis (IPA), Citizens' Participation, Behavioral Reasoning Theory (BRT)

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Chapter 1. Introduction

1.1 Background and Motivation

Over the past years, the implementation of smart city has been receiving critiques for its implementation and practices due to too much focus on the technological part and top-down in orientation, which put the government's interest higher than the citizens (Greenfield, 2013; Kitchin, 2014).

Since then, the effort to put citizens' interest in the center of the city's development has been more explored by researchers (Malek, Lim, & Yigitcanlar, 2021). One of the approaches that have been widely implemented is called the citizen-centric approach. This approach has two main characteristics (Berntzen, Johannesen, & Ødegård, 2016):

a. For the citizens: the city's development has to satisfy the citizen's needs.
b. With the citizens: the city's development has to encourage the citizens' to participate.

In addition, for the context of a smart city, Malek et al. explained that the concept of citizen-centric in smart city implementation focuses on the citizens' participation and responsibilities. Moreover, in their systematic literature review, they emphasized that the main focus of citizen-centric smart city implementation is no longer on the technology, but should focus more on the citizens and good policy (Malek et al., 2021).

As the capital city of Indonesia, Jakarta has been implementing the smart city concept since 2014 by carrying out six dimensions of smart city, namely Smart Economic, Smart Government, Smart Environment, Smart People, Smart Mobility and Smart Living (Satispi & Mufidayati, 2019). The Jakarta Smart City (JSC) has recently promoted itself as a smart city that implements the citizen-centric approach by designing its smart city initiatives based on the citizens' needs (Nugraha, 2020b).

1.2 Research Problems and Gaps

Conceptually, the citizen-centric smart city approach encourages the government to implement smart city initiatives by addressing the citizens' needs and putting them at the center of the city's development and participate in the smart city initiatives. However, prior studies on current smart city planning and implementation indicated that the citizens' actual needs as part of the city's sustainable goal are often not well considered in the smart city implementation.

In the current smart city implementation, Noy et al. described that smart city implementation tends to focus more on the technological and economic aspects than on achieving actual citizens' needs (Noy & Givoni, 2018). Similarly, Yigitcanlar also emphasized that current smart city implementation and practice do not adequately address the citizens' problems, especially for the future generation in sustainability goals (Yigitcanlar, 2018).

Additionally, implementing smart city initiatives that solve social issues and urban problems that the citizens have faced is quite challenging, particularly due to the limited resources and budget available on the government side. Thus, the government or policy maker needs to prioritize and focus on the smart city initiatives that currently need improvement and potentially address the citizens' actual needs (Lin, Zhao, Yu, & Wu, 2019).

While in the current academic literature space, most of the studies on a smart city focus primarily on the discussion of the benefits of smart city services for the citizens' well-being (Lin et al., 2019; Trencher & Karvonen, 2019); the improvement of the quality of their lives (De Guimarães, Severo, Felix Júnior, Da Costa, & Salmoria, 2020; Macke, Casagrande, Sarate, & Silva, 2018; Madakam, Ramaswamy R., & Date, 2019; Yeh, 2017), and the factors that influence the citizens when using the smart city services (Belanche, Casaló, & Orús, 2016; Yeh, 2017).

In more detail, Belanche et al., (2016) revealed that the citizen's need positively influences the citizens' attitude toward using and participating in the smart city

services. However, there are a small number of previous studies which explore the relationship between citizens' perceptions of satisfaction and their behavior intention toward participating in the citizen-centric smart city implementation. Some of them are Kopackova (Kopackova, 2019), who explored the citizen's need concept based on Maslow's theory and its relationship with the satisfaction survey in her study, as well as Oh (Oh, 2020) and Ji et al. (Ji, Chen, Wei, & Su, 2021) who addressed the perception and preference of the citizens' toward smart city services.

Therefore, given the gap in current academic literature in citizen-centric smart cities, as mentioned previously, further research addressing those gaps is needed.

1.3 Research Objectives

According to the research problem, this study has two main objectives as follows:

1. To determine the citizens' perspective of satisfaction toward the existing smart city initiatives in Jakarta Smart City using Customer Satisfaction Index (CSI) to determine its overall satisfaction and the Importance and Performance Analysis (IPA) method to identify the importance of each smart city initiative.

2. To analyze the relationship between citizen's satisfaction and participation intention in the smart city initiatives of Jakarta Smart City by using Behavioral Reasoning Theory (BRT) to fully understand the influence on the satisfaction and other factors such as the "*reason for*" and "*reason against*" participation in the smart city initiatives.

1.4 Research Questions

In achieving the research objectives, there are three (3) research questions in this study that need to be answered as the following:

1. To what extent do the existing smart city initiatives of Jakarta Smart City satisfy the citizens?
2. What are the relationships between citizen's satisfaction, reasoning factors, and the intention to participate in the smart city initiatives?
3. Is there any moderation effect in the citizens' awareness of smart city initiatives toward the reasoning factors and intention to participate in the smart city initiatives?

1.5 Research Benefits

The results of this study are expected to have the following benefits and contributions:

1. This study will provide the citizen's satisfaction level index and citizen's perception toward each of the existing smart city initiatives, which gives insightful report to the regulator to improve the existing smart city initiatives, or as a basis of prioritizing the smart city initiatives that satisfy the citizens' needs the most.
2. This study will give empirical findings regarding the role of citizen's satisfaction and its relationship with the citizen's intention to participate in the smart city initiatives. In more detail, the determinant reason that influences the citizens to participate in the smart city initiatives can be drawn specifically.
3. This study presents citizens' awareness of smart city initiatives as a moderating factor influencing citizens' reasons and intention to participate in smart city initiatives. By knowing that, the regulator and policy maker would be able to improve the citizens' participation rate by increasing the citizens' awareness.

1.6 Research Originality

As far as the author concerns, this study is the first research to examine the relationship between citizens' satisfaction, reasoning factors, and the behavior intention to participate in smart city initiatives using the Behavioral Reasoning Theory (BRT) in the context of citizen-centric smart city implementation.

1.7 Research Context

The study was carried out in the context of Jakarta Smart City. Jakarta City promotes itself as a smart city with a citizen-centric approach. The city aims to improve city stakeholders' active participation and engagement, including the citizens (Nugraha, 2020a). Thus, the implementation of a smart city in Jakarta becomes a case study for this research, which aligns with this study's objectives.

1.8 Research Outlines

The structure of this study is organized into five chapters. Introduction, as the first chapter, describes the research background, research problems, research objectives, research questions, research benefit, originality, and research outline.

The second chapter reviews the theoretical framework based on the literature review, namely the citizen-centric smart city approach, citizens' satisfaction concept, and citizens' participation behavioral theory.

Chapter 3 presents the research design in this study, including research hypothesis and model development, questionnaire design, data collection, and method used for data analysis.

Chapter 4 discusses the data analysis and results of the Citizens Satisfaction Analysis, PLS-SEM analysis, and the discussion part.

Chapter 5 summarizes this study by presenting the conclusion, theoretical implications, policy suggestion, study limitation, and future research.

Chapter 2. Literature Review

2.1 Citizen-centric Smart City Approach

The citizen-centric approach is defined as a concept that pays more attention to the citizens as part of the very important factor in the city's development. More specifically, Berntzen et al. (2016) emphasized that the citizen-centric approach consists of two characteristics that need to be included in the city's development. A city that implements a citizen-centric approach has to ensure that the city's development will address the citizens' social issues and involve them to participate in its process (Berntzen et al., 2016).

In the context of smart city, the citizen-centric approach is currently getting more attention from the researcher and municipal to improve the smart city development that provides better quality of life to the citizens due to citizen-centric nature by putting the citizens' interest first while initiating the public services in the city.

Malek et al. (2021), in the review of citizen-centric smart cities, stated that many researchers in prior studies have explored and explained the concept of citizen-centric in smart city development and implementation. The authors emphasized in their review that the concept of citizen-centric in the smart city implementation focuses on the citizens' participation and the role responsibilities of the citizens.

In addition, they suggested in their study that the current implementation of the smart city is no longer needed to focus on advancing the technology, but should be more focused on the citizens' social issues and problems to provide a better quality of life and better policy in the city.

Furthermore, the citizen-centric smart city is defined as a concept of smart city implementation with the main focus on the citizens' participation and the responsibilities of the people, including their role and attitudes. Figure 2.1.1

describes the citizen-centric smart city framework developed by Malek et al. (2021).

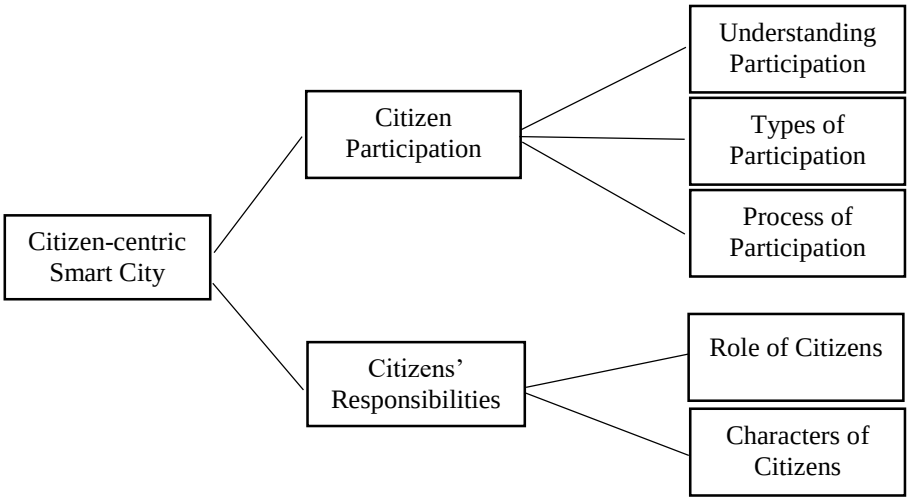

Figure 2.1.1 Citizen-centric Smart City Framework

In summary, the citizen-centric smart city approach can be seen as an effort to improve smart city implementation, which is used to be more technological based on a citizens-driven by addressing the real urban problem that citizens are facing to achieve a better quality of life.

2.2 Smart City Initiatives in Jakarta

The Jakarta city implements the citizen-driven approach to improve active participation and increase the city's stakeholder engagement (Nugraha, 2020a). There are six smart city indicators in Jakarta Smart City, with each indicator having several smart city initiatives. According to the report from Deloitte vision of Jakarta Smart City (Deloitte, 2016) and papers from Implementation of Jakarta Smart City (Satispi & Mufidayati, 2019) and Importance performance analysis for the smart city (Felasari & Roychansyah, 2019), the existing smart city initiatives in Jakarta Smart City is shown in the following table:

Table 2.2.1 Smart City Initiatives in Jakarta

No	Indicators	Code	Items
1.	Smart Governance	SG1	Government financial management (e-budget)
		SG2	One-stop integrated services (PTSP, JAKI)
		SG3	Open data (portal, map, api)
		SG4	Online report services (Qlue, CRM)
2.	Smart Mobility	SM1	Public transportation apps & Real-time info
		SM2	Smart card for public transportation
		SM3	Innovative and modern parking system
		SM4	Integrated multi-modal transportation (JakLingko)
		SM5	Smart traffic management
3.	Smart Environment	ENV1	Pollution control
		ENV2	Sustainable waste & water management
		ENV3	Smart public lighting
		ENV4	Green open space
4.	Smart Economy	ECO1	Startups ecosystems
		ECO2	Integrated smart card for payment (JakartaOne)
		ECO3	New labor market (internet-based)
		ECO4	Food-commodity information availability
5.	Smart People	SP1	Accessible online books and literature
		SP2	Online training and education availability
		SP3	Civic engagement activities using ICT
		SP4	Co-working space availability
6.	Smart Living	SL1	Housing sufficiency (integrated low-cost apart)
		SL2	Public safety and crime prevention (CCTV)
		SL3	Wi-Fi coverage at public space
		SL4	Flood information and prevention

2.3 Measuring the Citizens' Satisfaction

2.3.1 Customer Satisfaction Index (CSI)

According to Yi (Yi, 1990), customer satisfaction is a customer's response regarding the evaluation between expectations and the perceived performance of the services or product. The closer the perceived performance of services to the expectations, the higher the customer satisfaction is. Similarly, Lovelock (Lovelock & Wright, 2002) explained that customer satisfaction formed as a comparison result of the quality of the service expected and the actual quality of the service while it was delivered.

Customer satisfaction can be used to determine the level of loyalty or even to predict customer behavior. The prior study stated a relationship between satisfaction, loyalty, and the intention to rebuy the product or the intention to use the services (Yi & La, 2004). One method to determine the overall index level of customer satisfaction is using the Customer Satisfaction Index (CSI).

Customer Satisfaction Index (CSI) is a method to examine the overall level of customer satisfaction toward a particular product or service. Ali et al. (Ali, Ismail, Suradi, & Ismail, 2009) described the steps to examine the Customer Satisfaction Index (CSI) as follows:

a. First, calculate all of the Mean Performance Scores (MPS) and the Mean Importance Score (*MIS*) for each item of smart city initiatives in Jakarta, with the following formula:

$$MIS = \frac{\sum_{k=1}^{n} Xk}{n} \quad MPS = \frac{\sum_{k=1}^{n} Yk}{n}$$

b. Once the value of MPS and MIS is derived, the Weight Factor (WF) of importance is calculated using the following formula:

$$WF = \frac{MISi}{\sum_{i=1}^{p} MISi} \text{ X } 100\%$$

c. In the third step, the Weight Score (WS) is computed by multiplying the weight factor (WF) and the mean performance score (MPS) of certain initiatives, with the following formula:

$$WS = WFi \text{ X MPSi}$$

d. As the last step, the Customer Satisfaction Index (CSI) value can be examined by summing up the total Weight Score (WS) and divide it by the maximum scale that has been used in the questionnaire (in this study, the 5-likert scale is used) and its percentage. The formula can be seen as follows:

$$CSI = \frac{totalWS}{MaxScale} \text{ X } 100\%$$

After the CSI has been calculated, the category of satisfaction level can be determined. Heskett et al. (Heskett, Jr, & L, 1999) divided satisfaction level criteria into three categories, namely "Excellent," "Good," and "Unsatisfactory." In more detail, the satisfaction level criteria are shown in the following table:

Table 2.3.1 Satisfaction Level Criteria

No	CSI Value (%)	Satisfaction Level
1	81 – 100	Excellent
2	41 – 80	Good
3	0 – 40	Unsatisfactory

2.3.2 Importance and Performance Analysis (IPA) Method

Various methods in the academic literature can be used to examine customer satisfaction as a view perspective from the customer, or in the case of this study is from the perspective of the citizens. Among other customer satisfaction methods, the Importance and Performance Analysis (IPA) method developed by Martilla and James in 1977 is claimed to be an effective method applied in many studies on the customer satisfaction field (Ortigueira-Sánchez, Ortigueira-Bouzada, & Gómez-Selemeneva, 2017).

As in the context of citizens, the Importance and Performance analysis (IPA) has already been widely used to evaluate the citizens' satisfaction of government services from the perspective of its citizens (Ortigueira-Sánchez et al., 2017; Van Ryzin & Immerwhar, 2007; Wong, Hideki, & George, 2011).

In addition, the IPA method is considered to be useful for not only capable to determine the citizens' satisfaction toward public services but also due to its ease to use and can also be adapted to identify areas of focus strategy for improving existing and future government services (Wong et al., 2011).

Depending on the importance and performance values of the smart city initiatives given by citizens as survey respondents, the IPA method divides customer satisfaction into one of the four quadrants named Importance-performance grid.

Each of the grid represents the "Keep up the good work!", "Critical problem area, concentrate here!", "Potential overkill, cut back resources!" and "Low priority, but try to improve!" as shown in the below figure (Martilla & James, 1977).

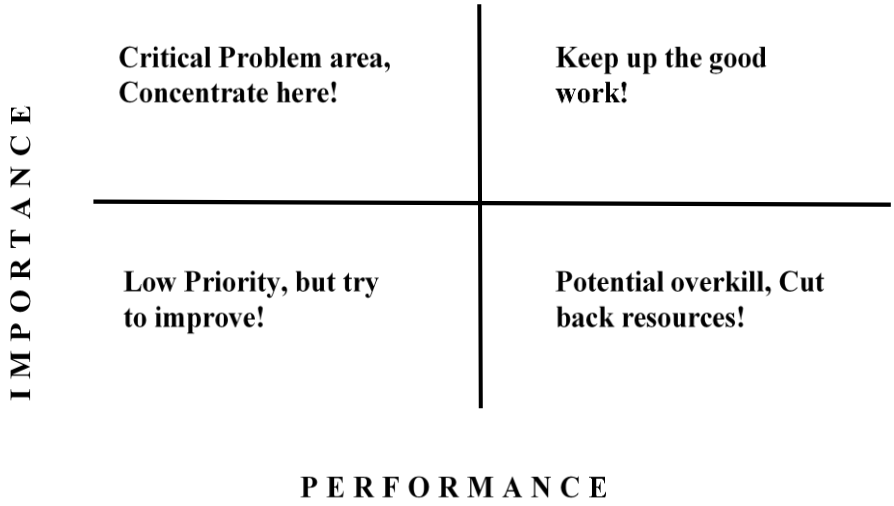

Figure 2.3.1 Importance and Performance Analysis Grid

The Importance and Performance Analysis Grid provides easy interpretation by mapping each of the products or services into four quadrants that they belong to. From the quadrant, the product or services can be further analyzed whether the resources of its services need to be cut or which of the existing smart city initiatives need to be prioritized.

2.4 Theories to Understand Citizens' Participation Behavior

According to Baum, citizen participation is defined as the citizen's involvement, whether in public decision-making or government services. The citizens can be represented as an organized community or even individuals. The type of participation also differs, whether in power delegation, observation, or even just using the public services (Baum, 2001).

In smart city initiatives, stakeholder participation is considered one of the keys to the success in implementing the smart city (Nam & Pardo, 2011). The role of citizens as a city's stakeholder has also been evolving due to the city's evolution, technological advancement, and modern society. This new role of citizens in the smart city concept required them to be more involved, active, and participative in government services (Hernàndez, 2021).

Therefore, understanding how the citizens' attitude and behavior toward smart city initiatives would provide decent information for the future implementation of a successful smart city. Researchers used the theory called behavioral theories in the academic literature to understand how the citizens would behave. Behavioral theories have been commonly described as an effort to understand user or consumer behavior and intentions based on its determinant and factors that influences them (Aditya Kumar Sahu, Padhy, & Dhir, 2020).

There are many theories of human behavior in the academic literature, such as the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), the Theory of Explanation-based Decision Making (TEDM), Behavioral Reasoning Theory (BRT), and others.

Each of the behavior theories has its own purpose, characteristic, and limitations to their implementations. For example, researchers have been questioning the ability of behavior theories like TPB and TRA to predict and generalize consumer behavior in terms of their limitations (Gilal, Zhang, Paul, & Gilal, 2019; Hagger, Chatzisarantis, & Biddle, 2002).

2.5 Behavioral Reasoning Theory (BRT)

Among other behavior theories, the Behavioral Reasoning Theory (BRT) is considered a new theory that measures user behavior originally developed by Westaby (2005). BRT is developed from other behavioral theories in the technological field by incorporating the beliefs, global motives, intention, user behavior, and emphasizing reasons for justifying the behavior decision (Westaby, 2005).

Compared to other behavior theories, BRT provides a better explanation by incorporating two additional measures: the reason for and reason against as the basis of human decision to do something. Also, the reason for and reason against measures in the BRT are context-specific, which provides more detailed analysis in terms of contextual condition (Claudy, Garcia, & O'Driscoll, 2015; Ryan & Casidy, 2018)

Unlike the previous behavioral theory models, the Behavioral Reasoning Theory (BRT) argued that reasons could predict attitudes. These reasons can help humans or individuals to justify, defend, and be responsible for their actions. In more detail, the relationship between constructs such as belief, reason, global motives, intention, and behavior in the BRT model developed by Westaby can be seen in Figure 2.5.1 below (Westaby, 2005).

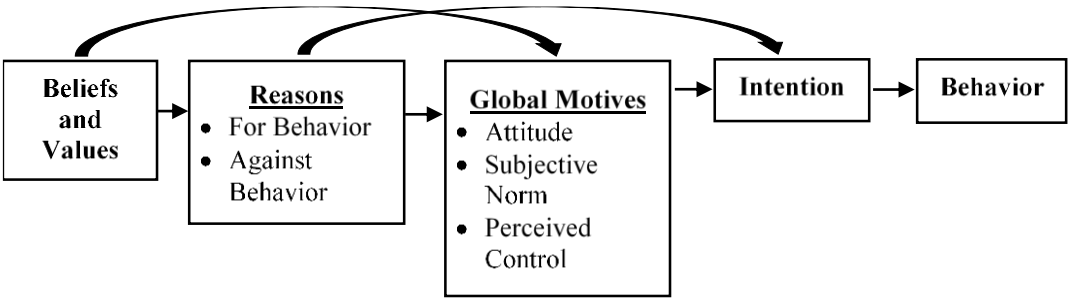

Figure 2.5.1 Original BRT Model (Westaby, 2005)

Since then, the BRT has been used in various research to study human behavior by focusing on the context-specific measure of reasons and has been explored and modified by other researchers.

Claudy et al. (2013) proposed a modified BRT model by detailing each reason for and reasons against constructs. Unlike the original BRT model, they did not combine the individual reasons measures but modeled it as a different construct in a second-order construct. That way, they were able to identify the degree of the influences of each specific reason on the behavioral attitudes and intentions. With this approach, the specific reasons that are having the most influences or least effect on the user behavior can be analyzed (Claudy, Peterson, & O'Driscoll, 2013)

Figure 2.5.2 below shows the modified BRT model proposed by Claudy et al. (2013), which expanded the reason constructs in the original BRT model into higher factor construct structures, namely second-order construct, which has specific advantages, the reason for, and the reason against to identify specific influences of a particular reason on the user behavior.

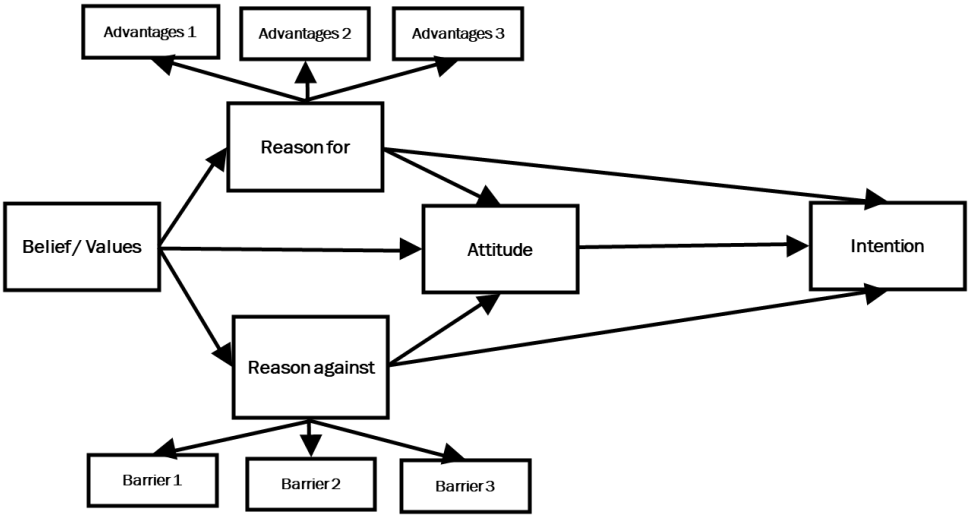

Figure 2.5.2 Modified BRT Model (Claudy, 2013)

Currently, the BRT model has started to receive attention and has been used by the researcher to study consumer or user intention or behavior in several fields such as organic food consumption behavior, donation activities, employee turnover, as well as technology acceptances and adoptions. The summary of prior studies or literature on the Behavioral Reasoning Theory (BRT) is provided in Table 2.5.1.

Table 2.5.1 BRT Literature

No	Study	Study Context	Variable Construct	Sample Data	Analysis Method & Tool
1	(Westaby, 2005)	Employee turnover	Values, Attitude, Perceived Behavioral Control, Subjective Norm, Reason for , Reason against, Intention, User Behavior	Using 4 study groups with different numbers of participants and respondents	SEM & AMOS
2	(Westaby, Probst, & Lee, 2010)	Organizational decision making	Reason for , Reason against, Attitude, Subjective Norm, Perceived Behavioral Control, Intention, User Behavior	283 US and 697 Australian respondents	SEM & AMOS
3	(Claudy et al., 2013)	Renewable energy system	Intention, Attitude, Reason for (Economic benefit, Environmental benefit, Independence benefit), Reason against (Cost barrier, Risk barrier, Incompatibility barrier), Value Alignment	254 home owners via telephone survey	SEM & AMOS
4	(Claudy & Peterson, 2014)	Urban bicycle commuting	Intention, Attitude, Reason for and against, Universalism values, Security values,	936 respondent	SEM & AMOS
5	(Claudy et al., 2015)	Customer resistance to Innovation (study 1. micro wind	Study 1: Intention, Attitude, Reason for (Financial benefit, Environmental benefit, Independence benefit), Reason against (Value barrier, Risk barrier, Usage barrier), Values.	Study 1 with 254 home owners Study 2 with 379 students and staffs	SEM & AMOS

		turbine, study 2 car sharing)	Study 2: Intention, Attitude, Reason for (Financial benefit, Convenience benefit, Flexibility benefit), Reason against (Risk barrier, Usage barrier), Values.		
6	(Gupta & Arora, 2017a)	Mobile banking adoption	Intention, Attitude, Reason for and against, Consumer values	379 Indian banking customers	SEM & AMOS
7	(Gupta & Arora, 2017b)	Mobile shopping adoption	Intention, Attitude, Reason for (price saving, Variety, Convenience), Reason against (Consumer anxiety, Self-Efficacy, Relative advantage), Value of Openness to change	237 Indian customers	PLS-SEM &SmartPLS
8	(Park, Cho, Johnson, & Yurchisin, 2017)	Role of social responsibility in apparel donation	Attitude (3-sub attitude), Self-oriented reason, other-oriented reason, Benevolence, Power	316 participants	SEM & AMOS
9	(Sivathanu, 2018a)	IOT wearable healthcare of older adults	Intention, Attitude, Ubiquitous, Relative Advantages, Compatibility, Convenient, Usage barrier, Traditional barrier, Risk barrier, Value of openness to change	167 data of respondents above 60 y.o	PLS-SEM & SmartPLS
10	(Pillai & Sivathanu, 2018)	M-learning apps adoption	Intention, Attitude, Reason for and against, Values	690 employees of IT companies	PLS-SEM & SmartPLS
11	(Ryan & Casidy, 2018)	Organic food	Intention, Attitude, Brand reputation, Reason for and *against*, Consumer values	617 respondents	SEM & Mplus
12	(Peterson & Simkins, 2019)	Commercial car sharing	Consumer values (stimulation, conformity), Reason for and *against*, Global motives	100 individuals	CFA, SEM

13	(Pillai & Sivathanu, 2020)	IOT adoption in Agriculture	Intention, Attitude, Relative advantage, Social influence, Perceived Convenience, Perceived Usefulness	1580 farmers from 10 villages	PLS-SEM & SmartPLS
14	(A.K. Sahu, Padhy, & Dhir, 2020)	Lean manufacturing in MSME	Intention, Attitude, Environmental Performance, Economic performance, Social performance, usage value risk traditional image barrier, power value, Education level (moderator)	Survey to 299 Indian MSME customer	SEM & SPSS, PROCESS, AMOS
15	(A. Dhir, Koshta, Goyal, Sakashita, & Almotairi, 2021)	E-waste recycling	Intention, Attitude, Environmental awareness (moderator), Value, Risk barrier, Personal Benefit, Image barrier, Environmental Benefit, Value barrier, Usage barrier	774 Japanese customers using an online survey	SEM & SPSS, AMOS
16	(Sreen, Dhir, Talwar, Tan, & Alharbi, 2021)	Brand love in natural product	Health consciousness, Reason for , Reason against, Attitude, Brand love, Environmental concern (mod)	949 respondents	SEM & SPSS, PROCESS, AMOS
17	(Huang & Qian, 2021)	Autonomous vehicle adoption	Face consciousness, Reason for , Reason against, Attitude, Intention, Need uniqueness & Risk aversion (Moderator)	849 individuals from an online questionnaire	SEM & SPSS, AMOS
18	(An, Ji, & Jan, 2021)	Innovative new products	Purchase intention, Purchase attitude, Reason for adoption, Reason against adoption, Values for change	242 customers from an online survey	SEM & AMOS
19	(Zafar, Maqbool, Cioca, Shah, & Masud, 2021)	Healthy packaged food	Intention, Attitude, Subjective Norm, Self-Efficacy, Reason to use, Reason against	14.567 students as questionnaire respondents	SEM & AMOS

Chapter 3. Research Methodology

3.1 Research Design

This study used a quantitative approach with survey questionnaires in collecting the data to achieve the research objectives and answer the research questions. Furthermore, figure 3.1.1 below shows the steps of this study's research design, including research model and hypotheses development, questionnaire design, data collection, and analysis method.

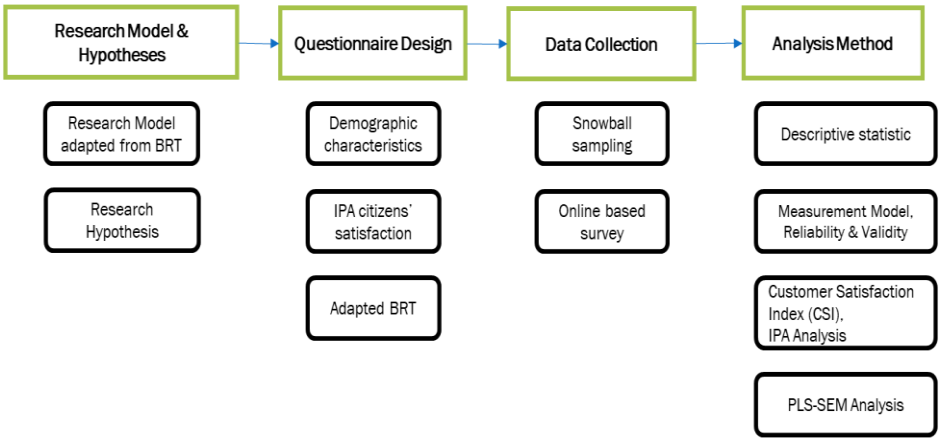

Figure 3.1.1 Research Design

3.2 Research Hypotheses and Model

In achieving the research objectives and address the research questions, this study proposed a model adapted from the BRT model, including the basic constructs of the BRT model, which was originally developed by Westaby (2005), such as Participation Intention (PAR), Attitude (ATT), Reason for (RF), Reason against (RA).

The proposed model in this study follows the second-order construct of BRT developed by Claudy et al. (2013), in which the construct of reason for would have three sub-constructs, namely responsiveness, relative advantages, and convenience. Meanwhile, the construct of Reason against has three sub-constructs: usage, risk, and incompatibility barriers. Lastly, the *satisfaction perception* of smart city initiatives acts as an independent construct in this study.

Figure 3.2.1 shows the visual relationship of each construct and variable in the proposed research model in this study. The proposed research model is controlled for demographic variables such as gender, age, educational background, and income. The moderation effect of citizens' awareness is also being analyzed. The development of hypotheses along with the theoretical background for the relationship between construct is discussed below:

3.2.1 Attitude and Participation

Attitude is defined as the psychological tendency to evaluate an entity based on the degree of the favorable and unfavorable (Eagly & Chaiken, 1998). Prior studies using BRT also confirm that attitude influences the behavioral intention in the context of innovation adoption such as wind turbine and car-sharing (Claudy et al., 2015), mobile banking, and mobile shopping adoption (Gupta & Arora, 2017a, 2017b).

In the context of citizen participation, prior literature demonstrated that attitude positively related to the citizens' participation in the police domain (Schreurs, Kerstholt, de Vries, & Giebels, 2018). Another study in sustainable water resource platforms also confirmed that attitude has significant influences on the participation of water management (Ahmed, Mokhtar, & Alam, 2020). Therefore, the following hypothesis is defined:

H1: Citizens' attitudes toward participation positively influence their intentions to participate in smart city initiatives.

3.2.2 Reason, Attitude, and Participation

The Behavioral Reasoning Theory (BRT) incorporated a unique construct that differs from previous behavioral theories with the context-specific reason construct that predicts global motives and consumer behavior. Reasons are defined as a subjective factor that customers use to justify and explain a particular behavior (Westaby, 2005).

Prior studies in different fields of study have resulted that reason (for/against) has strong positive/negative influences on attitude and participation intention (Claudy et al., 2015; Gupta & Arora, 2017a, 2017b; Pillai & Sivathanu, 2018).

In the context of this study, reasons (for/against) in participating in the smart city initiatives would support specific factors which affect citizens' intention in participating in the smart city initiatives. In addition, reasons would influence the citizen's intention to participate in smart city initiatives directly and indirectly through attitude. For example, citizens with a solid reason to participate or not participate in the smart city initiatives will also have a strong positive or negative attitude (Claudy et al., 2013).

Furthermore, Westaby (2005) stated that reasons also directly impact the intention without indirectly going through the attitude. People might not behave through their global motives such as attitude but decide their intention from the critical reason for that specific context (Claudy et al., 2013). In the case of this study, the citizens might have a positive attitude toward participating in smart city initiatives but might still decide not to participate due to the critical reason that hinders them. Therefore, the following hypotheses are proposed:

H2: "Reasons for" participating positively influences attitudes toward participating in smart city initiatives.
H3: "Reasons for" *participating positively affects citizens' intentions to participate in smart city initiatives*
H4: "Reasons against" participating negatively influences attitudes toward participating smart city initiatives.

H5: "Reasons against" participating negatively affects citizens' intentions to participate in smart city initiatives

3.2.3 Satisfaction, Reason, and Attitude

Customer satisfaction is defined as an evaluation response between expectations and the perceived performance of the services or product (Yi, 1990). The closer the perceived performance of services to the expectations, the higher the customer satisfaction is. Customer satisfaction can be used to determine the level of loyalty and to predict customer behavior. Yi & La (2004) stated a relationship between satisfaction, loyalty, and the intention to rebuy the product or the intention to use the services.

In smart city implementation, a previous study explored the relationship between citizen participation and citizen satisfaction. Citizen participation acted as an antecedent for citizen satisfaction, and citizen participation positively influenced citizen satisfaction (Wu & Jung, 2016; Xu & Zhu, 2020). The current study explores the relationship of citizens' satisfaction as a factor influencing the reasons and attitude contrast in the BRT model.

Specific in the context of BRT literature, Nicholss & Schimmel, in their study of generosity decision using the BRT model, examined satisfaction as an antecedent of both reason for and reason against construct and influence global motives (Nicholls & Schimmel, 2017).

Furthermore, this study adopts the Importance and Performance Analysis (IPA) method to define satisfaction by forming the latent variable of satisfaction from two measures: importance and performance items.

According to these explanations, this study investigates the citizens' satisfaction as an antecedent of the reasons and attitude construct. Citizens' satisfaction would positively influence the reason for and attitudes to participate in smart city initiatives and would negatively associate the reason against participating smart city initiatives. Therefore, the following hypotheses are proposed:

H6: Citizens' satisfaction is positively linked to attitude toward participating in smart city initiatives.
H7: Citizens' satisfaction is positively associated with reasons for *participating in smart city initiatives.*
H8: Citizens' satisfaction is negatively associated with reasons against *participating in smart city initiatives.*

3.2.4 "*Reasons*" Constructs Extraction

This study follows prior studies which defined the "reason for " and "*reason against*" construct consist of several sub-factors instead of bundling it into just one single construct of "*reason for*" and "*reason against*" (Claudy et al., 2013; Gupta & Arora, 2017a; Sivathanu, 2018a). This way, the influences or effects of each factor in "*reason for*" and "*reason against*" toward participation behavior can be examined in more detail.

The "*reason for* " in this study were extracted into "*relative advantages"* (Claudy et al., 2015; Gupta & Arora, 2017a; Sivathanu, 2018b), "*responsiveness*" (Li & Shang, 2020; Tolbert. Caroline & Mossberger, 2006), and "*convenience*" (Claudy et al., 2015; Pillai & Sivathanu, 2018). Those three factors are the common benefit that individuals will get when implementing the smart city initiatives, which will be acted as a basic reason for an individual in their attitude and behavior.

On the other hand, the "*reason against*" were extracted into three factors that are commonly be seen as difficulties that people are facing when implementing the smart city initiatives which will discourage the individual from participating in it, such as: "*usage barrier*" (Claudy et al., 2015, 2013; A. Dhir et al., 2021; Sivathanu, 2018a), "*risk barrier*" (Claudy et al., 2015, 2013; A. Dhir et al., 2021; Sivathanu, 2018a), and "*incompatibility barrier*" (Claudy et al., 2013; A. Dhir et al., 2021; Sivathanu, 2018a).

3.2.5 Citizens' Awareness as Moderating Variable

The moderator effect of citizens' awareness toward smart city initiatives concerning the reasons, attitude, and intention construct in BRT model is analyzed in this study. Through his Diffusion Innovation Theory (DOI), Rogers explained that awareness is the first step of adopting the innovation. Awareness is described as the extent of consciousness and general perception toward innovation in a specific target population (Dinev & Hu, 2007; Rogers, 1962).

Prior studies found that awareness has a strong influence on the user behavior of technological adoption (Ndayizigamiye, Kante, & Shingwenyana, 2020; Wang et al., 2015). Similarly, technology awareness has a positive relationship with the subjective norm, attitude, and behavior intention toward protective and preventive technology (Dinev & Hu, 2005, 2007).

In the context of BRT literature, a prior study analyzed the moderating effect of environmental awareness between the reason for, reason against, attitude, and behavior intention. The study found that environmental awareness positively moderates the association of reasons, attitudes and behavior intention (Amandeep Dhir, Koshta, Goyal, Sakashita, & Almotairi, 2021).

According to the discussion above, the following hypothesis is defined:

H9: Citizens' awareness of smart city initiatives positively moderates the association between reason, attitudes, and intention to participate in smart city programs.

The visual representation of the hypothesized relationship between variables or constructs in this study is shown in the figure 3.2.1 below:

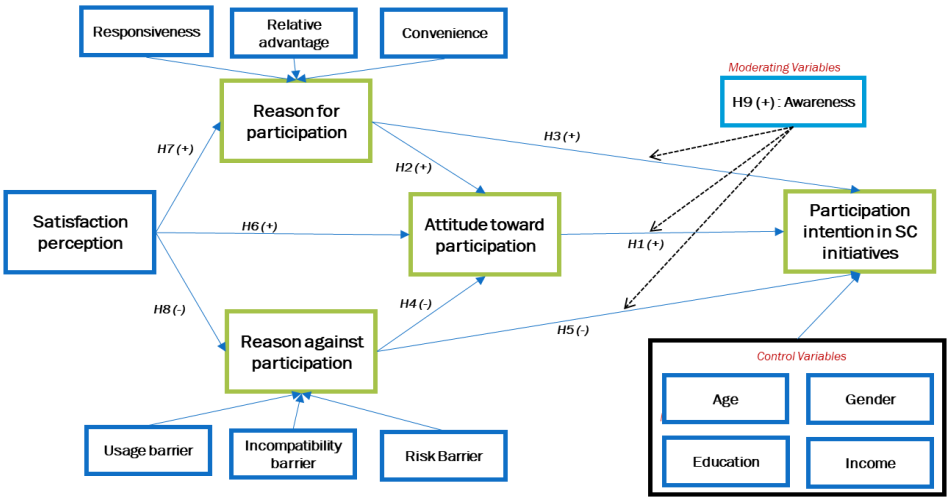

Figure 3.2.1 Hypothesized Research Model

The green squares in the above figure, namely *"reason for," "reason against," "attitude," and "intention,"* represents the constructs from the original BRT model. In contrast, the blue squares such as "*satisfaction," "responsiveness," "relative advantages," "convenience," "usage barrier," "incompatibility barrier,"* and *"risk barrier"* represent new constructs that are being proposed in this study.

The citizens' awareness is being analyzed as the moderating factor of the reason for, reason against, and citizen's attitude toward the participation intention in this study.

Furthermore, this study's research model incorporates demographic characteristics such as age, gender, education, and income as control variables to ensure the result is not biased.

The list of the hypotheses and model measurements can be seen in Tables 3.2.1 and 3.2.2 below:

Table 3.2.1 List of Hypotheses

No	Code	Hypothesis Descriptions	References
1	**H1**	Citizens' attitudes toward participation positively influence their intentions to participate in smart city initiatives.	(Ahmed et al., 2020; Claudy et al., 2013; Gupta & Arora, 2017a; Schreurs et al., 2018; Westaby, 2005)
2	**H2**	"*Reasons for*" participating positively influence attitudes toward participating in smart city initiatives.	(Claudy et al., 2015, 2013; Gupta & Arora, 2017a, 2017b; Pillai & Sivathanu, 2018; Westaby, 2005)
3	**H3**	"*Reasons for*" participating positively affect citizens' intentions to participate in smart city initiatives	(Claudy et al., 2015, 2013; Gupta & Arora, 2017a, 2017b; Pillai & Sivathanu, 2018; Westaby, 2005)
4	**H4**	"*Reasons against*" participating negatively influence attitudes toward participating in smart city initiatives.	(Claudy et al., 2015, 2013; Gupta & Arora, 2017a, 2017b; Pillai & Sivathanu, 2018; Westaby, 2005)
5	**H5**	"*Reasons against*" participating negatively affect citizens' intentions to participate in smart city initiatives	(Claudy et al., 2015, 2013; Gupta & Arora, 2017a, 2017b; Pillai & Sivathanu, 2018; Westaby, 2005)
6	**H6**	Citizen's satisfaction is positively linked to attitude toward participating in smart city initiatives	(Nicholls & Schimmel, 2017; Wu & Jung, 2016; Xu & Zhu, 2020)
7	**H7**	Citizens' satisfaction is positively associated with reasons for participating in smart city initiatives	(Nicholls & Schimmel, 2017; Wu & Jung, 2016; Xu & Zhu, 2020)
8	**H8**	Citizens' satisfaction is negatively associated with reasons against participating in smart city initiatives	(Nicholls & Schimmel, 2017; Wu & Jung, 2016; Xu & Zhu, 2020)
9	**H9a** **H9b** **H9c**	Citizens' awareness of smart city initiatives positively moderates the association between attitudes (H9a), reason against (H9b), and reason for (H9c) toward intention to participate in the smart city program	(Amandeep Dhir et al., 2021; Dinev & Hu, 2005, 2007; Ndayizigamiye et al., 2020; Wang et al., 2015)

Table 3.2.2 Model Measurement

No	Study Measures		References	Measurement Items
	2nd order	1st order		
1	Reason for (RF)	Relative Advantages (RFA)	(Claudy et al., 2015; Gupta & Arora, 2017a; Sivathanu, 2018b)	RF_ADV1: Smart city initiatives have more advantages as compared to previous public services RF_ADV 2: Smart city initiatives offer greater value to citizens RF_ADV 3: Smart city initiatives gives effectivity when interacting with government
2		Responsiveness (RFR)	(Li & Shang, 2020; Tolbert. Caroline & Mossberger, 2006)	RF_RESP1: Smart city initiatives will help me submit a request to the government quicker RF_RESP2: Smart city initiative allows me to interact with the government as soon as possible RF_RESP3: Smart city initiative will support the government to address my request quickly
3		Convenience (RFC)	(Claudy et al., 2015; Pillai & Sivathanu, 2018)	RF_CONV1: Smart city initiatives are convenient for citizen's participation RF_CONV2: Smart city initiatives will save time and effort for citizen's participation RF_CONV3: Smart city initiative provides an easy way to interact with government
4	Reason against (RA)	Usage barrier (RAU)	(Claudy et al., 2015, 2013; A. Dhir et al., 2021; Sivathanu, 2018a)	RA_USAGE1: Participating in smart city initiatives will requires new knowledge in technology RA_USAGE2: Smart city initiatives are only for technology savvy users RA_USAGE3: It is not easy to find information on smart city initiatives
5		Risk barrier (RAR)	(Claudy et al., 2015, 2013; A. Dhir et al., 2021; Sivathanu, 2018a)	RA_RISK1: I worry that there will be no resource (internet, device) available to participate in smart city initiatives. RA_RISK2: I worry that while participating in smart city initiatives, my data will be used improperly RA_RISK3: I worry that the smart city initiatives are not safe and secure

6		Incompatibility barrier (RAI)	(Claudy et al., 2013; A. Dhir et al., 2021; Sivathanu, 2018a)	RA_INCOMP1: The overall smart city initiatives do not fit well with my need. RA_INCOMP2: The overall smart city initiatives do not fit well with my lifestyle. RA_INCOMP3: In my opinion, the smart city initiatives do not fit well with how I will participate.
7	Satisfaction perception (SAT)		(Martilla & James, 1977; Nicholls & Schimmel, 2017; Wu & Jung, 2016; Xu & Zhu, 2020; Yi & La, 2004)	MEAN_IMP: To what extent do you think this smart city initiative is important. MEAN_SAT: To what extent do you think this smart city initiative is performing.
8	Awareness (Aware)		(A. Dhir et al., 2021; Dinev & Hu, 2007; Ndayizigamiye et al., 2020)	AWARE: To what extent do you know the smart city initiatives in Jakarta
9	Attitude (ATT)		(Ahmed et al., 2020; 2013; Gupta & Arora, 2017a; Schreurs et al., 2018; Westaby, 2005)	ATT1: Participating in the smart city initiative would be very good for me ATT2: Participating in the smart city initiative would give me many advantages ATT3: Participating in the smart city initiative would be a lot of value
10	Participation Intentions (PAR)		(Ahmed et al., 2020; Claudy et al., 2013; Gupta & Arora, 2017a; 2005)	PAR1: I will participate in the smart city initiative in future PAR2: I intend to participate in the smart city initiative in the near future

3.3 Questionnaire Design

This study implemented the survey questionnaire instrument to achieve the research objectives by asking the target respondent who lives in Jakarta city a set of questions on the scale of 1 – 5. The survey questionnaires were formed in the Indonesian language and divided into three (3) sections to make it clearer for the respondent.

Section I of the survey questionnaire was dedicated to collect the respondents' demographic profiles such as gender, age, education degree, and incomes. This question aimed to examine the control variable, which would be used later in the analysis.

Section II of the survey questionnaire aimed to collect data regarding the citizens' perceptions toward the importance and performance of the smart city initiatives in Jakarta.

Section III of the survey questionnaire was dedicated to collect data related to the citizens' attitude toward participation in the smart city initiatives. The list of the question for this section regarding the BRT model can be seen in Appendix A.

Furthermore, the complete list of the survey questionnaire can be seen in Appendix B.

3.4 Data Collection

Since the study is using a quantitative approach, the survey questionnaire method for data collection is selected. Furthermore, the survey questionnaire is considered the most appropriate technique for PLS-SEM research due to its advantages (Shuhaiber, 2018).

A set of questions based on the previous studies needs to be designed using the survey questionnaire method (Gray, 2009). In this study, the questionnaire is

being developed based on the IPA measurement and the BRT model. The detail of questionnaire design is explained in Chapter 3.3.

The survey questionnaire was conducted in the form of an online form using the Google Form online platform. The survey questionnaire link was distributed in May 2021 through chatting platforms and social media such as Facebook, Twitter, WhatsApp, and Instagram, targeting the people who work or live in Jakarta city.

In total, there were 187 responses gathered from the online survey. After data cleansing, 9 responses were considered invalid due to having the same answer for all item questions or unengaged responses. Therefore, only 178 data was used for the analysis.

3.5 Analysis Method

This study used several analysis methods to achieve the research objectives. Analytical tools were also used in this study, such as SPSS and SmartPLS software. SPSS was used for data preprocessing, IPA, and CSI analysis to determine the satisfaction level of the citizens. Meanwhile, SmartPLS examined the relationship among constructs in the BRT model using the PLS-SEM analysis. PLS-SEM was considered the best approach for exploratory-based research like this study (F. Hair Jr, Sarstedt, Hopkins, & G. Kuppelwieser, 2014).

Chapter 4. Results and Analysis

4.1 Introduction

In this chapter, the data collected through an online-based survey questionnaire was prepared and analyzed with statistical tools. The analysis mainly consisted of two parts: 1) the analysis of citizens' satisfaction toward the existing smart city initiatives using SPSS software; and 2) the path analysis of PLS-SEM using SmartPLS software version 3.3.3. Demographic profiles, descriptive analysis, and moderation analysis are also presented in this chapter.

4.2 Data Sample

The sample size in this study was 178 data. The minimum data samples for this study were first checked using the 10 Times Rule, which has been widely used as minimum sample size estimation in the PLS-SEM research proposed by Hair et al. (Joe F. Hair, Ringle, & Sarstedt, 2011). The maximum number of items is in the latent variable of the model (the RF), and RA latent variables consist of 9 items. Therefore, the sample size must meet the ten times of it, which is 9 x 10 = 90.

This study also used the Monte Carlo experiments for the minimum required sample with the Inverse-square root method and Gamma-exponential method suggested by Kock et al. (Kock & Hadaya, 2018). In this study, the value for the Gamma-exponential method was 160, and the Gamma-exponential method was 146.

The total data collected in this study was exceeding the minimum expected sample. Thus, this study's sample data size is considered sufficient (Gefen, Straub, & Boudreau, 2000).

4.3 Demographic Profiles

Among the 178 valid responses of the questionnaire, 48.3% were female, and 51.7 were male, making the respondent's distribution according to the gender equally balanced.

In terms of age, the respondents were aged between 18 – 27 years old with 15.7% and 28 – 37 years old with 68.5% and 38 – 47 years old with 12.9% and 48 – 57 years old with 2.8%. The respondents' age varied, with the most respondents within the age of 28 – 37, and the least was 48 – 57 years old.

Moving on to the education level, most of the respondents have Undergraduate education degrees, which corresponded to 67.4% of total respondents. The rest of the respondents have a Graduate degree with 25.3%, Senior High School with 6.7%, and a Doctoral degree with only one respondent or 0.6%.

As for the income level of the respondents, most of their incomes were above 4 Million Rupiah with the following details: 43.8% having income between 4 – 8 Million Rupiah, 22.5% having income between 8 – 12 Million Rupiah, and 23% having income above 12 Million Rupiah, and the last group of the respondent was having income lower than 4 Million Rupiah (10.7%).

Those four data of demographic category profile of the respondents were used as control variables in the analysis to ensure that the result would not have a bias in terms of those demographic characteristics. The summary of the demographic profile is as follows:

Table 4.3.1 Demographic Profile

Category	Item	Frequency	Percent (%)
Gender	Female	86	48.3
	Male	92	51.7
Age	18 - 27 y.o	28	15.7
	28 - 37 y.o	122	68.5
	38 - 47 y.o	23	12.9
	48 - 57 y.o	5	2.8

Education Degree	Senior High School	12	6.7
	Undergraduate	120	67.4
	Graduate	45	25.3
	Doctoral	1	.6
Income (Rupiah)	Below 4 Million	19	10.7
	4 - 8 Million	78	43.8
	8 - 12 Million	40	22.5
	Above 12 Million	41	23.0
Locations	West Jakarta	18	10.1
	Central Jakarta	80	44.9
	South Jakarta	43	24.2
	East Jakarta	26	14.6
	North Jakarta	11	6.2

4.4 Assessment of Citizens' Satisfaction Measurement

Reliability analysis

The reliability test was performed using SPSS software for each item of the IPA measurement. The value of Cronbach's Alpha for each item was above 0.9, which was meet the minimum threshold of the reliability test requirement of above 0.7 (Cortina, 1993).

Table 4.4.1 Cronbach's Alpha of IPA Measurement

Reliability Statistics of Total Importance and Satisfaction		
Cronbach's Alpha	Standardized Cronbach's Alpha	Total Items
.962	.963	50

No	Importance Item Statistics				
	Code	Mean	Std. Deviation	N	α if item deleted
1.	IMP_SG1	4.15	.879	178	.961
2.	IMP_SG2	4.37	.821	178	.962
3.	IMP_SG3	4.40	.806	178	.961
4.	IMP_SG4	4.31	.878	178	.961
5.	IMP_SM1	4.46	.752	178	.961
6.	IMP_SM2	4.36	.792	178	.961
7.	IMP_SM3	4.05	.872	178	.961
8.	IMP_SM4	4.34	.795	178	.962
9.	IMP_SM5	4.41	.785	178	.961
10.	IMP_ENV1	4.24	.864	178	.961
11.	IMP_ENV2	4.39	.811	178	.961
12.	IMP_ENV3	4.36	.777	178	.961
13.	IMP_ENV4	4.47	.753	178	.961
14.	IMP_ECO1	4.12	.845	178	.961
15.	IMP_ECO2	4.29	.811	178	.961
16.	IMP_ECO3	4.37	.786	178	.961
17.	IMP_ECO4	4.11	.773	178	.961
18.	IMP_SP1	4.16	.822	178	.962
19.	IMP_SP2	4.20	.877	178	.961
20.	IMP_SP3	4.22	.799	178	.961
21.	IMP_SP4	4.09	.872	178	.961
22.	IMP_SL1	4.12	.811	178	.961
23.	IMP_SL2	4.53	.775	178	.961
24.	IMP_SL3	4.29	.819	178	.961
25.	IMP_SL4	4.42	.793	178	.961

No	Performance Item Statistics				
	Code	Mean	Std. Deviation	N	α if item deleted
1.	SAT_SG1	2.91	.776	178	.961
2.	SAT_SG2	3.10	.871	178	.962
3.	SAT_SG3	3.14	.925	178	.961
4.	SAT_SG4	2.92	.860	178	.961
5.	SAT_SM1	3.20	.929	178	.962
6.	SAT_SM2	3.43	.822	178	.962
7.	SAT_SM3	3.06	.838	178	.962
8.	SAT_SM4	3.14	.881	178	.961
9.	SAT_SM5	2.85	.929	178	.961
10.	SAT_ENV1	2.72	.931	178	.962
11.	SAT_ENV2	2.52	.934	178	.961
12.	SAT_ENV3	2.56	.914	178	.961
13.	SAT_ENV4	2.96	.913	178	.961
14.	SAT_ECO1	2.87	.798	178	.961
15.	SAT_ECO2	3.22	.893	178	.961
16.	SAT_ECO3	2.89	.813	178	.961
17.	SAT_ECO4	2.82	.838	178	.961
18.	SAT_SP1	2.84	.858	178	.961
19.	SAT_SP2	2.94	.842	178	.961
20.	SAT_SP3	2.92	.879	178	.962
21.	SAT_SP4	2.92	.840	178	.961
22.	SAT_SL1	2.85	.813	178	.962
23.	SAT_SL2	2.65	.965	178	.962
24.	SAT_SL3	2.66	.920	178	.962
25.	SAT_SL4	2.64	.989	178	.961

4.5 Assessment of Measurement Model

In order to have accurate results and findings of a Partial Least Square Structural Equation Modeling (PLS-SEM) analysis, several requirements were required to be carried out correctly. Previous studies reviewed and provided a guideline on doing the PLS-SEM analysis for a better result. The measurement of the outer model is needed to be assessed, and the relationships among the indicators and latent variables/constructs are explained. In addition, if the result of the outer measurement model is significant, the structure of the inner model can be measured. The relationship between latent variables/constructs can also be explained (Joseph F. Hair, Ringle, & Sarstedt, 2013).

4.5.1 Common Method Bias

In behavioral research, when the data collection method used survey questionnaires which collecting data of dependent and independent variables from the same individuals, a prior study is suggested to check the common method bias/variances to ensure that there is no false consistency in internal data (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

This study examined the presence of common method bias using the collinearity assessment approach in PLS-SEM proposed by (Kock, 2015). Kock (2015) stated that the Variance Inflation Factor (VIF) values in the factor level of a model greater than 3.3 are considered common method bias.

By connecting the construct into one single construct in the model using SmartPLS software, the Inner Variance Inflation Factor (VIF) values were determined. The result indicated that there is no presence of common method bias in this study. Table 4.5.1 below shows the inner VIF values of the model.

Table 4.5.1 Inner VIF Values

	ATT	Age	Edu Degree	Gender	Income	Mod Aware	PAR	RA	RF	SAT
ATT		1.968	1.883	1.862	1.871	2.354	2.175	2.543	1.94	2.477
Age	1.093		1.165	1.151	1.1	1.084	1.09	1.135	1.09	1.084
Edu Degree	1.132	1.175		1.184	1.144	1.111	1.143	1.175	1.121	1.126
Gender	1.038	1.047	1.033		1.031	1.037	1.04	1.042	1.039	1.036
Income	1.152	1.151	1.196	1.193		1.205	1.142	1.194	1.18	1.169
Mod Aware	1.192	1.139	1.174	1.147	1.252		1.151	1.144	1.229	1.14
PAR	1.549	1.742	1.639	1.761	1.494	1.697		1.781	1.734	1.76
RA	1.14	1.107	1.13	1.093	1.074	1.08	1.138		1.138	1.137
RF	1.778	1.474	1.472	1.252	1.528	2.036	2.16	2.124		2.18
SAT	1.519	1.227	1.231	1.288	1.266	1.408	1.488	1.254	1.46	

4.5.2 Indicator Reliability, Consistency, and Convergent Validity

According to the guideline from Hair et al. (2013), reflective measurement models should assess the following matters:

a. Indicator reliability

The value of standardized indicator loadings in the exploratory study has to be above ≥ 0.40 or better above ≥ 0.70. Table 4.5.2 shows that all the indicator loadings in this study met the requirements.

b. Internal consistency reliability

In assessing the internal consistency of the items, Cronbach's alpha and composite reliability were used. Both of those measures should exceed 0.70. Table 4.5.2 shows that all variables have a composite reliability value greater than 0.7, which met the criteria. At the same time, the value of Cronbach's alpha was also greater than 0.7 for all variables, except for the RAU variable.

However, due to the variable's importance, the variable RAU was being reserved in this study. The Cronbach's alpha value of RAU was still above 0.6. Other research also supports that Cronbach's alpha should not be the only standard to assess the reliability (Iorio & Konicki, 1974).

c. Convergent validity (e.g., AVE ≥ 0.50)

The correlation of each indicator for the same construct was assessed with the convergent validity by examining the value of average variance explained (AVE). The requirement for convergent validity was explained by the value of AVE greater or equal to 0.50 (AVE ≥ 0.50). Table 4.5.2 below shows that the value of AVE for each construct was more than 0.50, which satisfied the criteria.

Table 4.5.2 Item Loading / Weight and Validity

2ND ORDER	1ST ORDER	Type	Loading / Weight	CR	AVE	Alpha
	PAR	Reflective		0.967	0.936	0.932
	PAR1		0.967			
	PAR2		0.968			
	ATT	Reflective		0.955	0.875	0.929
	ATT1		0.921			
	ATT2		0.941			
	ATT3		0.944			
RF	**RFA**	Reflective		0.936	0.829	0.897
	RF_ADV1		0.889			
	RF_ADV2		0.942			
	RF_ADV3		0.900			
	RFC	Reflective		0.942	0.845	0.908
	RF_CONV1		0.897			
	RF_CONV2		0.919			
	RF_CONV3		0.941			
	RFR	Reflective		0.954	0.873	0.927
	RF_RESP1		0.926			

	RF_RESP2		0.955			
	RF_RESP3		0.921			
RA	**RAI**	Reflective		0.879	0.707	0.793
	RA_INCOMP1		0.827			
	RA_INCOMP2		0.894			
	RA_INCOMP3		0.800			
	RAR	Reflective		0.879	0.710	0.787
	RA_RISK1		0.682			
	RA_RISK2		0.921			
	RA_RISK3		0.904			
	RAU	Reflective		0.810	0.588	0.648
	RA_USAGE1		0.745			
	RA_USAGE2		0.826			
	RA_USAGE3		0.726			
	SAT	Formative				
	MEAN_IMP		0.753			
	MEAN_SAT		0.575			

4.5.3 Discriminant Validity

The discriminant validity method examines the correlation degree of each construct to measure that the construct is not correlated with others. Hair et al. (2013) suggested using the Fornell-Larcker criterion to assess the discriminant validity. In addition, this study also used the Heterotrait-Monotrait Ratio (HTMT) approach proposed by Henseler et al. (Henseler, Ringle, & Sarstedt, 2015) to analyzes the similarity between latent variables.

Table 4.5.3 shows the values of the Fornell-Larcker criterion in this study. It represents the diagonal values of each measure in the model that are greater than other variables, which means there is no issue of discriminant validity in the model. Table 4.5.4 presents the Heterotrait-Monotrait Ratio (HTMT) of the model. Henseler et al. (2015) suggested that the requirement of the HTMT approach is less than 0.85. All of the measures in this study meet the criteria with all values less than 0.85.

Table 4.5.3 Fornell-Larcker Criterion

	ATT	***PAR***	***RAI***	***RAR***	***RAU***	***RFA***	***RFC***	***RFR***
ATT	0.935							
PAR	0.614	0.967						
RAI	0.195	0.167	0.841					
RAR	-0.159	-0.101	0.200	0.843				
RAU	-0.051	-0.100	0.198	0.364	0.767			
RFA	0.659	0.519	0.233	-0.106	0.036	0.911		
RFC	0.651	0.470	0.243	-0.037	-0.041	0.690	0.919	
RFR	0.542	0.459	0.146	-0.059	-0.097	0.691	0.700	0.934

Table 4.5.4 Heterotrait-Monotrait Ratio (HTMT)

	ATT	***PAR***	***RAI***	***RAR***	***RAU***	***RFA***	***RFC***	***RFR***
ATT								
PAR	0.659							
RAI	0.231	0.196						
RAR	0.194	0.125	0.244					
RAU	0.21	0.181	0.273	0.515				
RFA	0.721	0.568	0.278	0.138	0.282			
RFC	0.71	0.512	0.29	0.086	0.221	0.765		
RFR	0.584	0.494	0.171	0.163	0.196	0.758	0.762	

4.5.4 Model Fit Criteria

Unlike Covariance-based Structural Equation Modelling (CB-SEM), which is used to assess the model fit of the structural model, Partial Least Square Structural Equation Modeling (PLS-SEM) does not depend much on the concept of model fit. The researchers should be really careful when reporting the model fit of PLS-SEM as it has not been comprehensively tested (Joseph F. Hair, Risher, Sarstedt, & Ringle, 2019).

However, researchers have been trying to examine the model fit in PLS-SEM by mimicking the process of CB-SEM. Furthermore, this study suggested that

the model fit in PLS-SEM can be assessed using consistent PLS analysis proposed by Dijkstra & Henseler (Dijkstra & Henseler, 2015).

Therefore, Table 4.5.4.1 shows the model fit result of this study from the SmartPLS software using the consistent PLS method. The common criteria for each value are described as follows:

- SRMR should be less than 0.08 (SRMR < 0.08).
- d_ULS & d_G should be less than the confident internal uses in the study (d_ULS & d_G < confident interval), this study used confident interval of 0.95.
- The closer value of NFI to 1 is the better. Ideally, the value should be greater than 0.9.

Table 4.5.5 Model Fit

	Saturated Model	***Estimated Model***
SRMR	0.048	0.0680
d_ULS	0.356	0.7100
d_G	0.181	0.2210
Chi-Square	150.04	180.9650
NFI	0.899	0.8780

4.5.5 Second-order Construct Measurement

This study implemented a higher-order construct (HOC) with Type II of reflective-formative higher-order constructs for the research model. Therefore, this study follows the guideline from Sarstedt et al. (Sarstedt, Hair, Cheah, Becker, & Ringle, 2019) of how to measure the structural model of the higher-order construct with reflective-formative higher-order construct by using the two-stages approach of PLS-SEM analysis using SmartPLS that is described in Chapter 4.6.2.

4.6 Analysis

4.6.1 Citizens' Satisfaction Analysis

This chapter aims to determine the satisfaction level of citizens toward the existing smart city initiatives in order to provide an empirical answer to the first research question in this study, which is "*to what extent do the existing smart city initiatives of Jakarta Smart City satisfy the citizens?*". In more detail, this study used the Customer Satisfaction Index (CSI) and Importance and Performance Analysis (IPA) method explained in the following chapter.

4.6.1.1 Customer Satisfaction Index (CSI)

Following the steps and formula to determine the CSI as described in Chapter 2.2.3. Table 4.6.1 below shows the value of the mean performance score (MPS), the value of mean importance score (MIS), the value of weight factor (WF), the value of weight score (WS), and finally the value of Customer Satisfaction Index (CSI).

Table 4.6.1 Result of CSI

	ATTR	***IPA***			***CSI***	
		MIS	**MPS**	**GAP**	**WF**	**WS**
SMART GOVERNMENT	SG1	*4.152*	*2.910*	*-1.242*	*0.039*	*0.113*
	SG2	*4.365*	3.101	-1.264	0.041	0.126
	SG3	*4.404*	3.140	-1.264	0.041	0.129
	SG4	*4.315*	2.921	-1.393	0.040	0.118
SMART MOBILITY	SM1	*4.455*	3.202	-1.253	0.042	0.133
	SM2	*4.360*	3.433	-0.927	0.041	0.140
	SM3	*4.051*	3.062	-0.989	0.038	0.116
	SM4	*4.337*	3.140	-1.197	0.040	0.127
	SM5	*4.410*	2.848	-1.562	0.041	0.117
SMART ENVIRONMENT	ENV1	*4.236*	2.725	-1.511	0.040	0.108
	ENV2	*4.393*	2.522	-1.871	0.041	0.103

	ENV3	*4.360*	2.556	-1.803	0.041	0.104
	ENV4	*4.466*	2.955	-1.511	0.042	0.123
SMART ECONOMY	ECO1	*4.118*	2.865	-1.253	0.038	0.110
	ECO2	*4.287*	3.225	-1.062	0.040	0.129
	ECO3	*4.365*	2.893	-1.472	0.041	0.118
	ECO4	*4.112*	2.820	-1.292	0.038	0.108
SMART PEOPLE	SP1	*4.157*	2.837	-1.320	0.039	0.110
	SP2	*4.197*	2.944	-1.253	0.039	0.115
	SP3	*4.225*	2.921	-1.303	0.039	0.115
	SP4	*4.090*	2.921	-1.169	0.038	0.111
SMART LIVING	SL1	*4.118*	2.848	-1.270	0.038	0.109
	SL2	*4.528*	2.646	-1.882	0.042	0.112
	SL3	*4.292*	2.663	-1.629	0.040	0.107
	SL4	*4.421*	2.640	-1.781	0.041	0.109
TOTAL		107.213	72.742			2.910
CSI= (Total WS / max scale) x 100%						**58.19%**

The Customer Satisfaction Index (CSI) for the existing smart city initiatives in Jakarta is 58.19%. According to the satisfaction level criteria, this value is considered to be “Good”.

However, this study concluded that this satisfaction level is low by looking at the value of the CSI with only 58.19%. In addition, the gap values indicate that all smart city initiatives have negative values, which means that the citizens perceived the performance values less than the importance of all initiatives in Jakarta Smart City.

4.6.1.2 Importance and Performance Analysis (IPA)

The Importance and Performance Analysis grid was formed using the simple scatterplot graph from the value of MIS and MSS for each value in Table 4.6.1, with the median values of importance and performance acted as the vertical and horizontal lines. By using the SPSS software, the scatterplot graph of the IPA grid can be seen in the following figures:

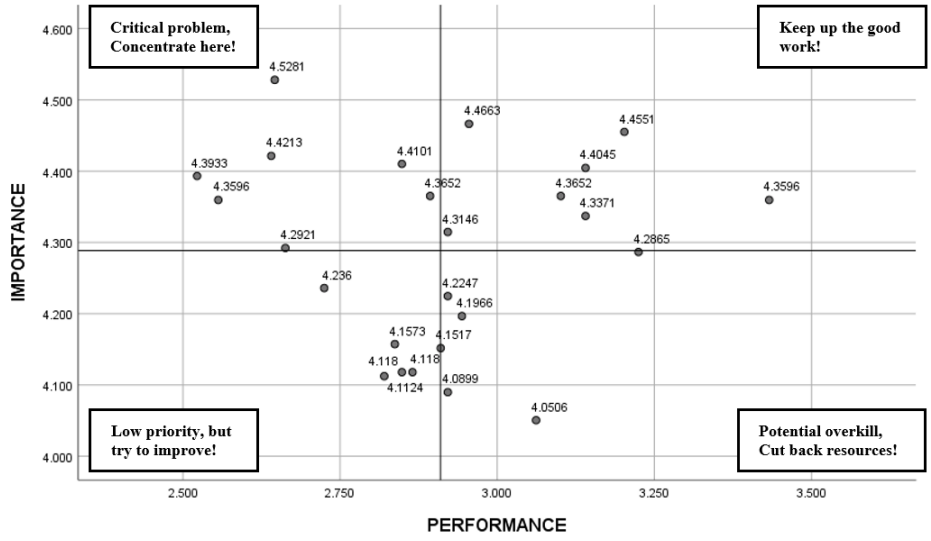

Figure 4.6.1 Importance and Performance Grid

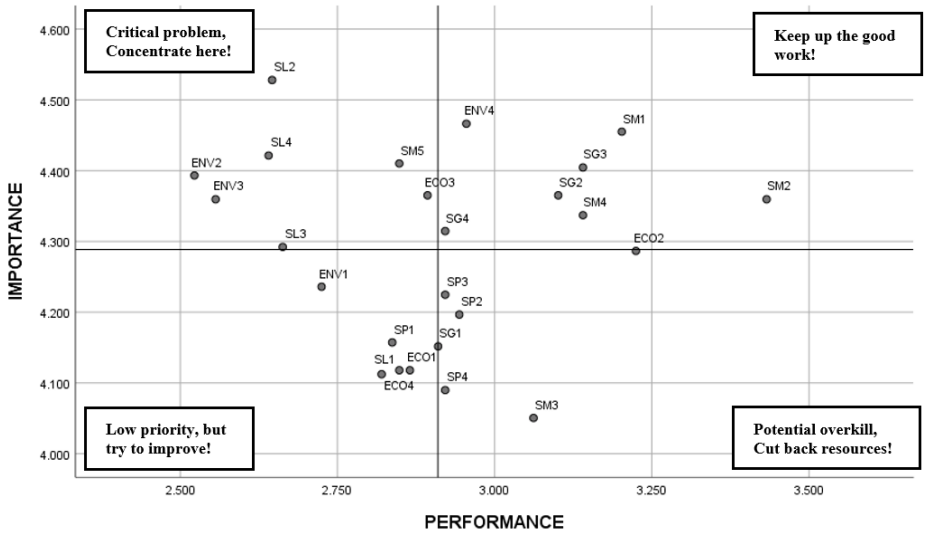

Figure 4.6.2 Importance and Performance Grid – label

In more detail, here is the list of smart city initiatives regarding the result of the IPA grid analysis:

Q1 – Critical problem, concentrate here!

- SL2 – public safety and crime prevention (CCTV)
- SL3 – WIFI coverage at public space
- SL4 – flood information and prevention
- ENV2 – sustainable waste & water management
- ENV3 – smart public lighting
- ECO3 – new labor market
- SM5 – smart traffic management

Q2 – Keep up the good work!

- SM1 – public transportation apps & real-time information
- SM2 – smart card for public transportation
- SM4 – integrated multi-modal transportation
- SG2 – one-stop integrated services (JAKI, PTSP)
- SG3 – open data (portal, map, API)
- SG4 – online report services (Qlue, CRM)
- ENV4 – green open space
- *ECO2 – integrated smart card for payment (jakartaOne)*

Q3 – Low priority, but try to improve!

- ENV1 – pollution control
- ECO1 – startups ecosystems
- ECO4 – food commodity information availability
- SL1 – housing sufficiency (integrated low-cost apart)
- SP1 – accessible online book and literature
- *SG1 – government financial management (e-budgeting)*

Q4 – Overkill, cut back resources!

- SP2 – online training and education availability
- SP3 – civic engagement activities using ICT
- SP4 – co-working space availability
- SM3 – innovative and modern parking system
- *ECO2 – integrated smart card for payment (jakartaOne)*
- *SG1 – government financial management (e-budgeting)*

The IPA grid above implies that the citizens perceived Smart Living, Smart Mobility, Smart Government, Smart Environment, and Smart Economic as public services they need the most. Furthermore, the government should concentrate on and improve those Smart City dimensions.

4.6.2 Structural Equation Modelling (PLS-SEM) Analysis

The purpose of the Partial Least Square Structural Equation Modeling (PLS-SEM) analysis in this chapter was to investigate the relationships between factors in the proposed research model adopted from the Behavioral Reasoning Theory (BRT) to provide an answer to the second research question, which is "*What is the relationship among citizen's satisfaction, reasoning factors and the intention to participate in the smart city initiatives?*". In addition, the moderation analysis had also been conducted in this chapter to answer the third research question in this study, which is "*Is there any effect of moderation in the citizens'* awareness *of smart city initiatives toward the reasoning factors and intention to participate in the smart city initiatives*?".

4.6.2.1 Assessment of Structural Model

After assessing the measurement model in Chapter 4.5, its analysis results were valid and met all the criteria. In this chapter, the Partial Least Square Structural Equation Modeling (PLS-SEM) analysis is used to examine the structural model and the relationship between constructs using SmartPLS software with version 3.3.3. The values of path coefficients, their significance, and the result of hypothesis testing can be seen in Table 4.6.2 below:

Table 4.6.2. Structural Relationship and Hypothesis Testing

Hypo-theses	***Path***	***Path Coefficient***	***STDEV***	***T Statistic***	***P Values***	***Support***
H1	Attitude -> Participation intention	0.469	0.094	4.979	0.000	**Yes**
H2	Reason for -> Attitude	0.601	0.068	8.778	0.000	**Yes**
H3	Reason for -> Participation intention	0.211	0.091	2.323	0.020	**Yes**
H4	Reason against -> Attitude	-0.092	0.116	0.796	0.426	No
H5	Reason against -> Participation intention	-0.045	0.086	0.526	0.599	No
H6	Satisfaction -> Attitude	0.165	0.058	2.838	0.005	**Yes**

H7	Satisfaction -> Reason for	0.515	0.060	8.618	0.000	**Yes**
H8	Satisfaction -> Reason against	-0.125	0.184	0.681	0.496	No

The testing hypothesis resulted that among eight (8) hypotheses related to the research model except for the moderation effect, five (5) hypotheses have been supported, such as H1, H2, H3, H6, and H7.

The result shows three (3) hypotheses that have not been supported in this study, namely H4, H5, and H8. More specifically, all of the hypotheses that have not been advocated are related to the "*reason against*" construct.

The results show that "*satisfaction*" positively influences the "*reason for*" and "*attitudes*" but does not significantly influence the "*reason against*" participation. The "*reason against*" was also found not to have a significant relationship with "*attitudes*" and "*participation intention*", with negative path coefficient values. It shows that they have an opposite association with each other.

On the other hand, the "*reason for*" significantly influences the "*attitude*" and "*participation intention*" positively. Lastly, the result strongly shows that the "*attitude*" positively influences the "*participation intention*" with a significant value.

The values of R-square (R^2) and the predictive relevance of Q-square (Q^2) of the dependent constructs in the research model such as "*attitude*", "*reasons for*" *"participation"*, "*reasons against*", and "*participation intention*" toward smart city initiatives is shown in the table below:

	R^2	Q^2
ATT	0.534	0.454
PAR	0.419	0.365
RA	0.016	-0.000
RF	0.265	0.196

ASSESSMENT OF PREDICTIVE RELEVANCE (Q^2)

(Hair et al., 2011)

VALUE	Effect Size
0.02	Small
0.15	Medium
0.35	Large

Based on the values of R^2 and Q^2 in the above table, this study provides a decent number in explaining the attitude (53%), participation intention (42%), and "*reason for*" (26%). However, the "*reason against*" was found to be not explained very well (1.6%). This value is in line with the predictive relevance (Q^2) of "*reason against*", which has zero (-0.00), while the other constructs have predictive relevance of medium to large effects.

4.6.2.2 Moderation Analysis of *"Citizens'* Awareness*"*

This study analyzes the moderating effect of citizens' awareness of smart city initiatives toward the relationship between citizens' attitude and their participation intention, reason against and participation intention, and reason for and participation intention. The moderation analysis result, along with the hypotheses testing and slope analysis, are shown in the following table and figures:

Table 4.6.3. Moderation Analysis Result

Hypo-theses	*Path*	*Path Coefficient*	*STD EV*	*T Statistics*	*P Values*	*Support*
H9a	Awareness * ATT -> PAR	0.401	0.123	3.260	0.0010	**Yes**
H9b	Awareness * RA -> PAR	0.065	0.068	0.952	0.3410	No
H9c	Awareness * RF -> PAR	-0.262	0.110	2.372	0.0180	**Yes**

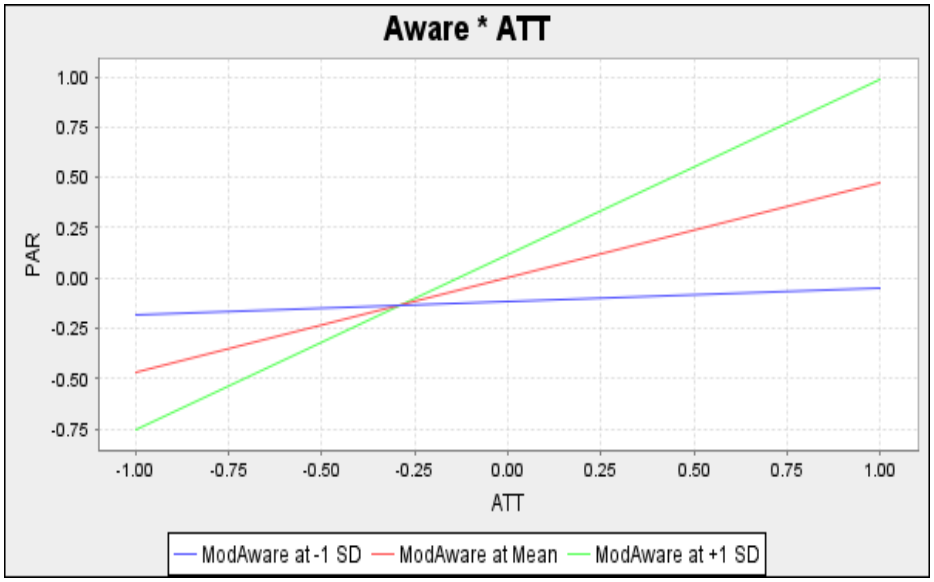

Figure 4.6.3 Slope Analysis of Moderation Awareness toward Attitude to Participation Intention

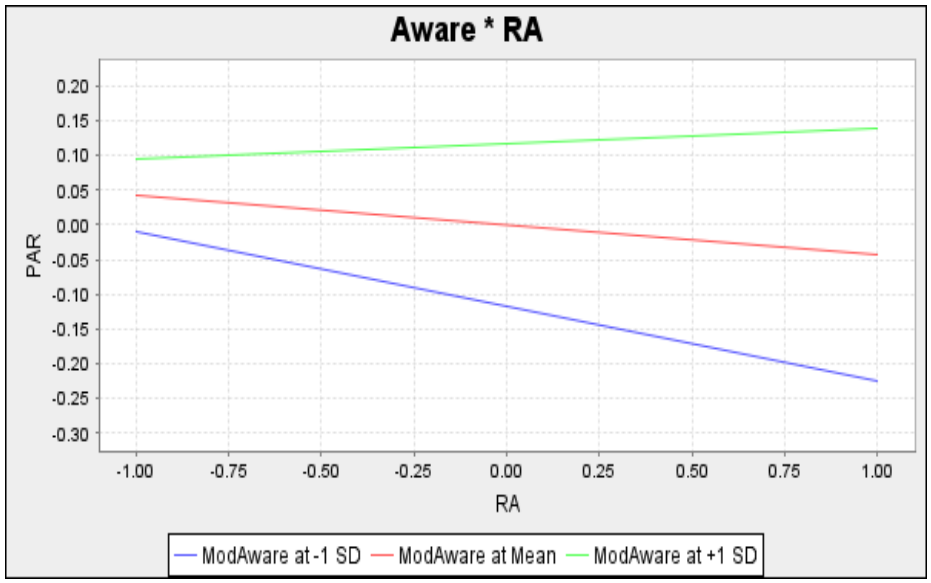

Figure 4.6.4. Slope Analysis of Moderation Awareness toward Reason against to Participation Intention

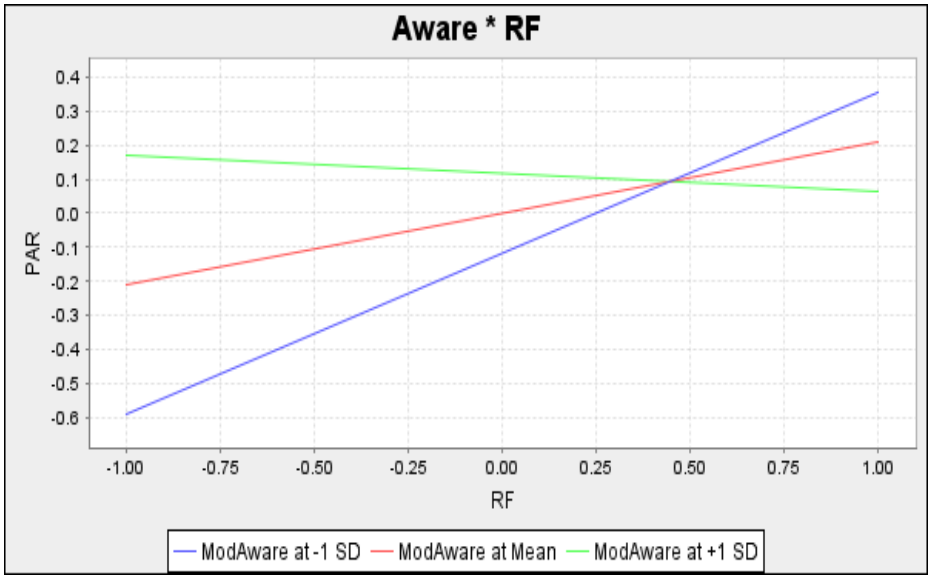

Figure 4.6.5. Slope Analysis of Moderation Awareness toward Reason for to Participation Intention

As shown in the table and figures above, the citizens' awareness has a moderation effect and supports the hypotheses H9a and H9c, which are the association between attitude and participation intention; and reason for and participation intention. Whereas, the hypotheses H9b of citizens' awareness moderating the reason against participation intention is not supported in this study.

The citizens' awareness significantly moderates the influence of the citizens' attitude on participation intention with a positive association. It implies that the more aware the citizens are of smart city initiatives, the stronger the influence of citizens' attitudes on the participation intention is.

However, the citizens' awareness significantly moderates the influence of the reason on the participation intention with a negative association. In other words, the more aware the citizens are of the smart city initiatives, the less the influence of the reason on participation intention is.

4.7 Discussion

This study applied two main analyses, namely customer satisfaction analysis and PLS-SEM analysis. Each of the analyses aims to answer different research questions in this study. The customer satisfaction analysis with CSI and IPA examined citizens' satisfaction toward current smart city initiatives.

The PLS-SEM analysis was used to investigate the participation intention of citizens toward smart city initiatives by analyzing the relationship among construct with context-specific reason in the context of the implementation of a citizen-centric smart city in Jakarta. More specifically, this study emphasized the role of citizens' satisfaction as an antecedent toward reasons and global motives (attitude).

The last part of the analysis in this study examined the moderation effect of citizens' awareness with the relationship between "*reason for*" toward "*participation intention*", "*reason against"* toward "*participation intention*", and "*attitude*" toward "*participation intention*".

In the context of smart city development and implementation for developing countries, through the result of the analysis, this study can provide a supportive conclusion for completing the result of previous research regarding the importance of improving citizens' participation, encouraging the bottom-up approach, and fulfilling the citizens' need by investigating their *satisfaction perception* toward smart city initiatives (Joia & Kuhl, 2019; Staletić, Labus, Bogdanović, Despotović-Zrakić, & Radenković, 2020; Tan & Taeihagh, 2020; Viale Pereira, Cunha, Lampoltshammer, Parycek, & Testa, 2017).

Finally, the detailed discussion of the analysis results as an answer to each of the research questions in this study is presented in Section of 4.7.2.

4.7.1 Answer to Research Questions

4.7.1.1 Research question #1 – Citizens' satisfaction level

The CSI and IPA analysis show that the level of citizens' satisfaction toward the existing smart city initiatives in Jakarta Smart City is considered as less satisfactory with a value of only 58.19%.

In more detail, the result indicated that the average of importance and performance of the existing smart city initiatives in Jakarta are 4.28 out of the maximum value of 5 and 2.91 out of the maximum value of 5. In other words, most of the citizens in Jakarta currently perceived the smart city initiatives as important services they need to improve their quality of life.

This result is consistent with prior research, which also concluded that the citizens in other cities in Indonesia, such as Surabaya, Yogyakarta, and Magelang, perceived the smart city programs as an important service (Felasari & Roychansyah, 2019; Sani & Felasari, 2018).

Furthermore, the result of IPA analysis in this study provided detailed findings on which smart city initiatives in Jakarta need to be improved or reallocated in terms of resources usage for the prioritization purpose to improve the effectiveness of public services.

The IPA analysis resulted that citizens in Jakarta perceived most of the services in the dimension of Smart Mobility (SM), such as smart traffic management, Smart Government (SG), Smart Living (SL), Smart Environment (ENV), and "new labor market" in Smart Economy (ECO) as important to them compared to other smart city initiatives.

The least important smart city initiatives or things that citizens do not actually need are online training and education availability, civic engagement, co-working space (Smart People), and a modern parking system (Smart Mobility).

4.7.1.2 Research question #2 – Factors of citizens' participation behavior

The result of PLS-SEM analysis showed the relationship among construct in the BRT model and determined the results of the hypothesis testing. Among the first eight (8) hypotheses in the proposed research model, there are five (5) hypotheses that are supported and three (3) hypotheses that are not supported.

The "*citizens' attitude*" strongly influences the "*participation intention*", which supports hypothesis H1. This result is consistent with the previous studies that attitude positively influences intention (Claudy et al., 2015; Dhir et al., 2021).

The "*reason for*" has a positive relationship that influences the "*citizens' attitude*" and the "*participation intention*". This result is in line with previous studies that reason for has a strong positive effect on attitude and intention (Westaby et al., 2010; Claudy et al., 2015; Tandon et al., 2020; Dhir et al., 2021).

In more detail, among convenience, relative advantage, and responsiveness factors in participating in the smart city initiatives, the responsiveness has the least influence compared to other factors in the reason for construct. This result showed that citizens' do not fully see the responsiveness as the benefit of smart city initiatives or that the existing smart city initiatives do not show responsiveness in their implementation yet.

Meanwhile, the proposed variable of "*citizens' satisfaction*" in this study has significant influences on the "reason for " and "*citizens' attitude*" with a positive association. This result is consistent with prior studies that conclude the ability of satisfaction in determining the customer intention or behavior (Nicholls & Schimmel, 2017; Wu & Jung, 2016; Xu & Zhu, 2020).

However, the "*citizens' satisfaction*" does not significantly influence the "*reason against*" with negative values of the association. Furthermore, the result indicated that all of the construct associates with the "*reason against"* has a negative relationship and does not significantly influence any other construct that does not support the H4, H5, and H8.

Regarding this result, prior studies also found that "*reason against*" insignificantly influences the "*attitude*", but they found it significantly influences the "*intention"* (Claudy et al. 2015; Dhir et al., 2021).

The different results of this study can possibly be formed as the reason constructs in the BRT model are context-specific which means that it depends on the research study and context. It can be interpreted that the citizens' in Jakarta do not perceive usage, risk, and incompatibility as barriers or reasons to not participating in the smart city initiatives.

4.7.1.3 Research question #3 – Moderation effect of citizens' awareness

The moderation analysis of citizens' awareness shows that citizens' awareness significantly moderates the association of reason for toward participation intention with the negative association and citizens' attitude toward participation intention with the positive association. This result is consistent with prior studies, which also concluded that awareness positively influences the usage behavior of technological adoption, attitude, and behavior intention toward protective and preventive technology (Dinev & Hu, 2005, 2007; Ndayizigamiye et al., 2020; Wang et al., 2015). On the other hand, this study found that citizens' awareness does not have a moderation effect on the association of reason against and participation intention.

The result indicates that the higher the citizens' awareness, the stronger the influence of citizens' attitudes on participation intention. At the same time, the lower the citizens' awareness toward smart city initiatives, the stronger the influence of the reason for on participation intention.

The negative association result of citizens' awareness of the reason for toward participation intention emphasized the result on the previous PLS-SEM analysis, which showed that responsiveness is not perceived as the benefit of smart city initiatives. The result implies that the more aware the citizens are of smart city initiatives, the more likely they are to know that the existing smart city initiatives do not offer responsiveness as its benefit.

4.7.2 Data Privacy and Security as the Biggest Challenge

The study found that data privacy and security as part of the "*risk barrier*" are the biggest challenges in smart city implementation. Figure 5.4.2 in Appendix C showed that among three barriers in the "*reason against*" construct, the risk barrier was found to be the having the largest value of path coefficient (0.575), usage barrier (0.246), and incompatibility barrier (-0.894). In other words, it indicates that the citizens truly concern about how their data will be used properly and how secure the system is in the smart city implementation.

Smart City, an inter-connected city that collects and manages data from various data sources in the city through sensors and IoT, is prone to privacy and security issues. Prior studies have also been explored and proposed solutions to overcome these challenges by identifying different types of privacy in the smart city (Eckhoff & Wagner, 2018), describing any attack in smart city implementation (Popescul & Radu, 2016), and investigating the privacy and security solution in the smart city application (Zhang et al., 2017).

In terms of smart city implementation, it is important to identify the right security solution approach due to smart city implementation that generally consists of different platforms, systems, and technology providers. Prior study has been studied the sharing mechanism of security information among stakeholders such as security solution provider, security information provider, government, standardization agency and end-user (Rashid, Noor, & Altmann, 2021).

In addition, the security manager also needs to identify the right security solution provider that is best suited to the city's current condition due to various security solution providers available to be chosen. In this case, Noor et al. have investigated and proposed a framework on how to rank the security solution provider based on customer perspective of their security program and requirement (Noor, Anwar, Altmann, & Rashid, 2020).

Chapter 5. Conclusion

5.1 Conclusion

This study analyzed the citizens' satisfaction, citizens' awareness, and its relation with other factors affecting citizens' participation intention toward smart city initiatives to answer the three research questions that have been developed: (1) To what extent do the existing smart city initiatives of Jakarta Smart City satisfy the citizens? (2) What are the relationships between citizen's satisfaction, reasoning factors, and the intention to participate in the smart city initiatives? (3) Is there any moderation effect in the citizens' awareness of smart city initiatives toward the reasoning factors and intention to participate in the smart city initiatives?

The first research question had been answered by analyzing the citizens' satisfaction level using the Customer Satisfaction Index (CSI) and Important and Performance Analysis (IPA).

The findings of the study showed that the level of citizens' satisfaction toward smart city initiatives in the Jakarta Smart City is considered less satisfactory, with only 58.19%. However, despite the low level of satisfaction toward smart city initiatives performances, the citizens are found to have a perception of the smart city initiatives as an important service they need to improve their quality of life with an average value of important 4.28 out of the maximum value of 5.

The IPA analysis in this study provided detailed findings on which smart city initiatives in Jakarta need to be improved or reorganized in terms of resource usage and effectiveness. In addition, the IPA analysis indicated that the citizens in Jakarta perceived most of the services in the dimension of Smart Mobility (SM), such as smart traffic management, Smart Government (SG), Smart Living (SL), Smart Environment (ENV), and "new labor market" in Smart Economy (ECO) as important to them compare to other smart city initiatives. In contrast, the least important smart city initiatives or the things that citizens do not actually need are online training and education availability, civic

engagement, co-working space (Smart People), and a modern parking system (Smart Mobility).

In addressing the second research question, this study used the PLS-SEM analysis to investigate the proposed research model adopted from the BRT model, which consists of the relationship among factors influencing citizen participation intention and testing the hypotheses.

The study summarized that the "*citizens' attitude*" significantly influences the "*participation intention*", which supports hypothesis H1. Meanwhile, the "*reason for*" also has a significant positive relationship that influences the "*citizens' attitude*" and the "*participation intention*". In more detail, among the sub-factors of convenience, relative advantage, and responsiveness factor in the "*reason for*" construct, responsiveness was found to have the least influence compared to relative advantage and convenience. This result implied that citizens' do not fully see responsiveness as the benefit of smart city initiatives. The existing smart city initiatives might not provide the responsiveness benefit in the implementation as they should be.

The "*citizens' satisfaction*" construct in this study was found to have significant influence on the "*reason for*" and "*citizens' attitude*" with a positive association. However, the "*citizens' satisfaction*" has a negative association with the "*reason against*" but is not significantly supported in this study. Furthermore, the result indicated that all of the construct associated with the "*reason against"* has a negative relationship and does not have a significant influence on any other construct which are not support the hypotheses of H4, H5, and H8.

It can be interpreted from the result that the data sample in this study could not provide enough evidence to conclude that citizens in Jakarta perceived usage, risk, and incompatibility as barriers or reasons to not participating in smart city initiatives. On the other hand, the result indicated that the risk barrier consisting of data privacy and security is the biggest challenge in smart city implementation as it has the highest path coefficient compared to others.

Lastly, the third research question had been answered by performing the moderation analysis. The result showed that the citizens' awareness regarding the smart city initiatives has a moderation effect in the association of "*reason for"* toward "*participation intention*" with a negative association and "*attitude"* toward "*participation intention*" with a positive association. However, citizens' awareness does not moderate the "*reason against*" and "*participation intention*". The result indicated that the higher the citizens' awareness, the influence of citizens' attitude on participation intention become stronger. At the same time, the higher the citizens' awareness toward smart city initiatives are, the lower the influence of the reason for on participation intention will be.

The negative association of moderating effect of citizens' awareness in "*reason for*" toward "*participation intention*" emphasized the result on the PLS-SEM analysis, which showed that responsiveness in the "*reason for*" construct was found to be not perceived as the benefit of smart city initiatives by the citizens. Therefore, the more aware the citizens are of the smart city initiatives, the more likely they are to perceive that the existing smart city initiatives do not offer responsiveness in their implementation as they should be.

The result of this study provides empirical analysis and feedback not only to enrich the understanding of citizen-centric smart city implementation and development from the perspective of citizens and their behavior, but also can be used as valuable input for the government and policy maker in order to improve the smart city initiatives that truly address the citizens' needs and problems.

5.2 Theoretical Implications

This study contributes to the existing literature of citizen-centric smart city development and implementation by investigating the citizen's satisfaction with smart city initiatives implementation and its relationship with the citizens' participation behavior. Furthermore, this study introduces the use of the BRT model to understand citizens' behavior in smart city implementation.

This study offers findings that could enlarge the understanding of citizens' satisfaction and its relation with the participation behavior regarding the determinant factors, reasons, and the moderation effect of citizens' awareness.

5.3 Policy Suggestions

This study provides findings that will be useful for the policy maker. The study gives an empirical result for the overall satisfaction level of the citizens toward smart city initiatives. This result and the IPA analysis can be used as empirical feedback from the citizens for the policy maker and/or government official to improve and reorganize the prioritization of smart city initiatives more effectively.

The study found that citizens perceived smart city initiatives overall as an important service for improving their quality of life. However, they do not satisfy enough with the current smart city initiative performances. In addition, the citizens showed their favorable smart city initiatives that they think will benefit them the most and the smart city initiatives that they do not actually need. With these findings, the policy maker will be able to prioritize, reorganize and improve the smart city initiatives that address the citizens' need the most.

In terms of citizens' participation behavior, this study provides valuable findings regarding the determinant factor influencing citizens in deciding to participate in the smart city initiatives. The study found that citizens were concerned about data privacy and security as part of the risk barrier in smart city implementation. The study also found that responsiveness does not seem

to benefit current smart city initiatives as it should be. Furthermore, this study offers empirical findings on the effect of citizens' awareness and their participation intention. The interesting finding found in this study is that the more awareness the citizens have on the existing smart city initiatives, the lower the participation intention is. This implies that citizens do not perceive "*responsiveness*" as the benefit currently offered by the existing smart city initiatives.

Therefore, the government official and/or policy maker should focus more on improving the "*responsiveness*" of smart city initiatives to encourage the citizens to be more active and participate in smart city initiatives.

5.4 Limitation and Future Research

This study used online survey questionnaires for the data collection, which makes the data prone to many limitations. Even though the analysis has resulted appropriately, the number of the data or even the quality of the data becomes the limitation of this study. Therefore, future studies are encouraged to use different data collection methods such as in-depth interviews as a comparison to this study.

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Abbreviation

Abbreviation	Meaning
CSI	Customer Satisfaction Index
IPA	Importance and Performance Analysis
SEM	Structural Equation Modelling
CB-SEM	Covariance-based Structural Equation Modelling
PLS-SEM	Partial Least Squares Structural Equation Modelling
BRT	Behavioral Reasoning Theory
VIF	Variance Inflation Factor
AVE	Average Variance Extract
HTMT	Heterotrait-Monotrait Ratio
JSC	Jakarta Smart City
MPS	Means Performance Score
MIS	Means Importance Score
WF	Weight Factor
WS	Weight Score
PAR	Participation Intention
ATT	Attitude toward participation
RF	Reason For participation
RA	Reason Against participation
SAT	Satisfaction
RAU	Reason Against Usage barrier
RAI	Reason Against Incompatibility barrier
RAR	Reason Against Risk barrier
RFR	Reason For Responsiveness
RFC	Reason For Convenience
RFA	Reason For Relative Advantage
SM	Smart Mobility
SG	Smart Governance
SL	Smart Living
ECO	Smart Economy
SP	Smart People
SE	Smart Environment

Appendix A – Behavioral Reasoning Theory (BRT) Measurement

Construct	Indicator / Item
Participation intention	• I will participate in the smart city initiative in future • I intend to participate in the smart city initiative in near future
Attitude toward participation	• Participating in smart city initiative would be very good to me • Participating in smart city initiative would give me lot of advantages • Participating in smart city initiative would a lot of value
Reason for	
• Relative advantages	• Smart city initiatives have more advantages as compared to previous public services • Smart city initiatives offer greater value to citizens • Smart city initiatives gives effectivity when interacting with government
• Responsiveness	• Smart city initiatives will help me submit request to the government quicker • Smart city initiative allows me to interact with government as soon as possible • Smart city initiative will support government to address my request quickly
• Convenience	• Smart city initiatives are convenient for citizen's participation • Smart city initiatives will save time and effort for citizen's participation • Smart city initiative provides easy way to interact with government
Reason against	
• Usage barrier	• Participating in smart city initiatives will requires new knowledge in technology • Smart city initiatives are only for technology savvy users • It is not easy to find information on smart city initiatives
• Risk barrier	• I worry that there will be no resource (internet, device) available to participate in smart city initiatives. • I worry that while participating in smart city initiatives, my data will be used improperly • I worry that the smart city initiatives are not safe and secure
• Incompatibility barrier	• The overall smart city initiatives do not fit well with my need. • The overall smart city initiatives do not fit well with my lifestyle. • In my opinion, the smart city initiatives do not fit well with the way I will participate.
Awareness	• To what extend do you know the smart city initiatives in Jakarta

Appendix B – Survey Instrument

서 울 대 학 교
SEOUL NATIONAL UNIVERSITY
ITPP

Kuesioner Penelitian tentang Persepsi dan Partisipasi Masyarakat terhadap Implementasi Smart City di Jakarta

Selamat Pagi/Siang/Malam,

Perkenalkan nama saya Digi Indra Sukmana, mahasiswa magister di program studi IT Professional Program (ITPP) dan Smart City Global Convergence (SCGC) di Seoul National University, Korea.

Saat ini saya sedang melakukan penelitian tentang persepsi dan sikap partisipasi masyarakat pada implementasi smart city di Jakarta. Tujuan dari penelitian ini adalah untuk mengukur dan menganalisa persepsi dan sikap partisipasi anda terhadap implementasi smart city di Jakarta.

Saya sangat mengharapkan partisipasi anda, yang tinggal atau bekerja di area Jakarta, untuk mengisi kuesioner penelitian yang akan memerlukan waktu kurang lebih 7 - 15 menit ini. Respon dan jawaban anda pada survei ini hanya akan digunakan untuk kepentingan penelitian dan sepenuhnya akan dijaga kerahasiaannya.

Sebagai bentuk apresiasi atas partisipasi anda, jika berkenan silakan mengisi alamat email atau nomor handphone anda pada akhir kuesioner ini untuk mendapatkan pulsa / ovo / gopay senilai 100.000 rupiah bagi 10 responden yang beruntung.

Jika anda memiliki pertanyaan terkait kuesioner penelitian ini, silakan menghubungi saya melalui email

Terima kasih atas partisipasi anda pada penelitian ini.

Salam,
Digi Indra Sukmana
IT Professional Program & Smart City Global Convergence
Technology Management, Economics and Policy Program
Seoul National University, Republic of Korea.

Part I: Demographic Profile

Q1. Age (y.o)?

☐ **0 – 17**, ☐ 18 – 27, ☐ 28 – 37, ☐ 38 – 47, ☐ 48 – 57, ☐ Lebih dari 57

Q2. Gender?

☐ Male, ☐ Female.

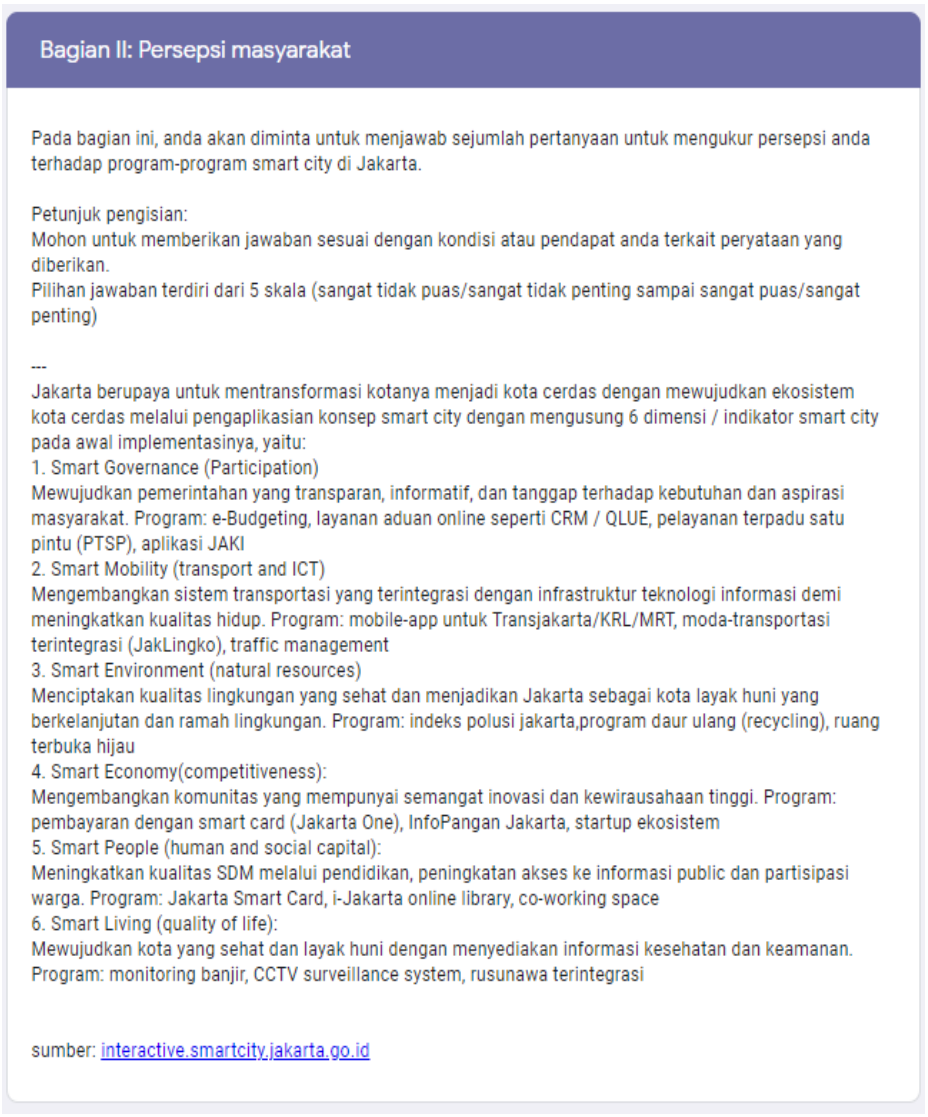
Q3. Education Degree?

☐ Senior High School, ☐ Undergraduate, ☐ Graduate, ☐ Doctoral.

Q4. Income (in Rupiah)?

☐ < 4.000.000, ☐ 4.000.000 – 8.000.000, ☐ 8.000.000 – 12.000.000,

☐ > 12.000.000



Bagian II: Persepsi masyarakat

Pada bagian ini, anda akan diminta untuk menjawab sejumlah pertanyaan untuk mengukur persepsi anda terhadap program-program smart city di Jakarta.

Petunjuk pengisian:
Mohon untuk memberikan jawaban sesuai dengan kondisi atau pendapat anda terkait peryataan yang diberikan.
Pilihan jawaban terdiri dari 5 skala (sangat tidak puas/sangat tidak penting sampai sangat puas/sangat penting)

Jakarta berupaya untuk mentransformasi kotanya menjadi kota cerdas dengan mewujudkan ekosistem kota cerdas melalui pengaplikasian konsep smart city dengan mengusung 6 dimensi / indikator smart city pada awal implementasinya, yaitu:
1. Smart Governance (Participation)
Mewujudkan pemerintahan yang transparan, informatif, dan tanggap terhadap kebutuhan dan aspirasi masyarakat. Program: e-Budgeting, layanan aduan online seperti CRM / QLUE, pelayanan terpadu satu pintu (PTSP), aplikasi JAKI
2. Smart Mobility (transport and ICT)
Mengembangkan sistem transportasi yang terintegrasi dengan infrastruktur teknologi informasi demi meningkatkan kualitas hidup. Program: mobile-app untuk Transjakarta/KRL/MRT, moda-transportasi terintegrasi (JakLingko), traffic management
3. Smart Environment (natural resources)
Menciptakan kualitas lingkungan yang sehat dan menjadikan Jakarta sebagai kota layak huni yang berkelanjutan dan ramah lingkungan. Program: indeks polusi jakarta,program daur ulang (recycling), ruang terbuka hijau
4. Smart Economy(competitiveness):
Mengembangkan komunitas yang mempunyai semangat inovasi dan kewirausahaan tinggi. Program: pembayaran dengan smart card (Jakarta One), InfoPangan Jakarta, startup ekosistem
5. Smart People (human and social capital):
Meningkatkan kualitas SDM melalui pendidikan, peningkatan akses ke informasi public dan partisipasi warga. Program: Jakarta Smart Card, i-Jakarta online library, co-working space
6. Smart Living (quality of life):
Mewujudkan kota yang sehat dan layak huni dengan menyediakan informasi kesehatan dan keamanan. Program: monitoring banjir, CCTV surveillance system, rusunawa terintegrasi

sumber: interactive.smartcity.jakarta.go.id

Part II: Citizens Perception

Scales:

SD: Strongly Disagree

D: Disagree

N: Neutral

A: Agree

SA: Strongly Agree

Smart City Dimension: Smart Governance

No	Item	Performance					Importance				
		SA	A	N	A	SA	SA	A	N	A	SA
1.	Government financial management (e-budgeting)										
2.	One stop integrated services (ptsp, jaki)										
3.	Online report services (qlue, CRM)										
4.	Open data (portal, map, api)										

Smart City Dimension: Smart Mobility

No	Item	Performance					Importance				
		SA	A	N	A	SA	SA	A	N	A	SA
1.	Public transportation apps & Real-time information										
2.	Smart card for public transportation										
3.	Innovative and modern parking system										
4.	Integrated multi-modal transportation (jaklingko)										
5.	Smart traffic management										

Smart City Dimension: Smart Environment

No	Item	Performance					Importance				
		SA	A	N	A	SA	SA	A	N	A	SA
1.	Pollution control										
2.	Sustainable waste & water management										
3.	Recycling program										
4.	Green open space										

Smart City Dimension: Smart Economy

No	Item	Performance					Importance				
		SA	A	N	A	SA	SA	A	N	A	SA
1.	Startups ecosystems										
2.	Integrated smart card for payment (jakartaone)										
3.	New labor market (internet-based)										
4.	Food-commodity information availability										

Smart City Dimension: Smart People

No	Item	Performance					Importance				
		SA	A	N	A	SA	SA	A	N	A	SA
1.	Accessible online books and literatures										
2.	Online training and education availability										
3.	Civic engagement activities using ICT										
4.	Co-working space availability										

Smart City Dimension: Smart Living

No	Item	Performance					Importance				
		SA	A	N	A	SA	SA	A	N	A	SA
1.	Housing sufficiency (integrated low-cost apart)										
2.	Public safety and crime prevention (CCTV)										
3.	Wifi coverage at public space										
4.	Flood information and prevention										

Part III: Participation Attitude

Answer description:

SD: Strongly Disagree
D: Disagree
N: Neutral
A: Agree
SA: Strongly Agree

Construct	Item Questions	Answer				
		SD	D	N	A	SA
Participation intention	• I will participate in the smart city initiative in future • I intend to participate in the smart city initiative in near future					
Attitude toward participation	• Participating in smart city initiative would be very good to me • Participating in smart city initiative would give me lot of advantages • Participating in smart city initiative would a lot of value					
Reason for						
• Relative advantages	• Smart city initiatives have more advantages as compared to previous public services • Smart city initiatives offer greater value to citizens • Smart city initiatives gives effectivity when interacting with government					
• Responsiveness	• Smart city initiatives will help me submit request to the government quicker • Smart city initiative allows me to interact with government as soon as possible • Smart city initiative will support government to address my request quickly					
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• Incompatibility barrier	• The overall smart city initiatives do not fit well with my need. • The overall smart city initiatives do not fit well with my lifestyle. • In my opinion, the smart city initiatives do not fit well with the way I will participate.					
Awareness	• To what extend do you know the smart city initiatives in Jakarta					

Appendix C – PLS-SEM Analysis with SmartPLS

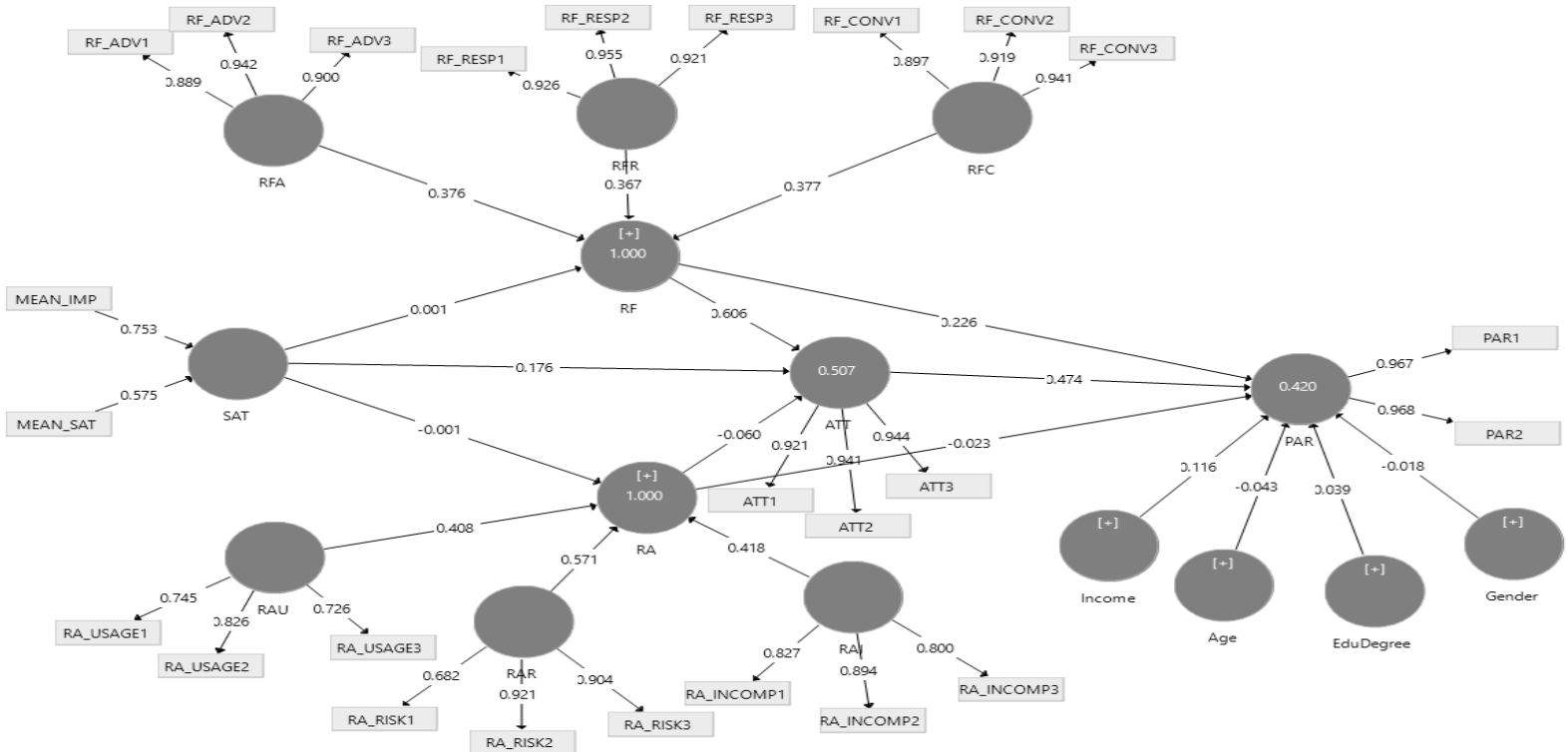

Figure 5.4.1 First-stage PLS Analysis

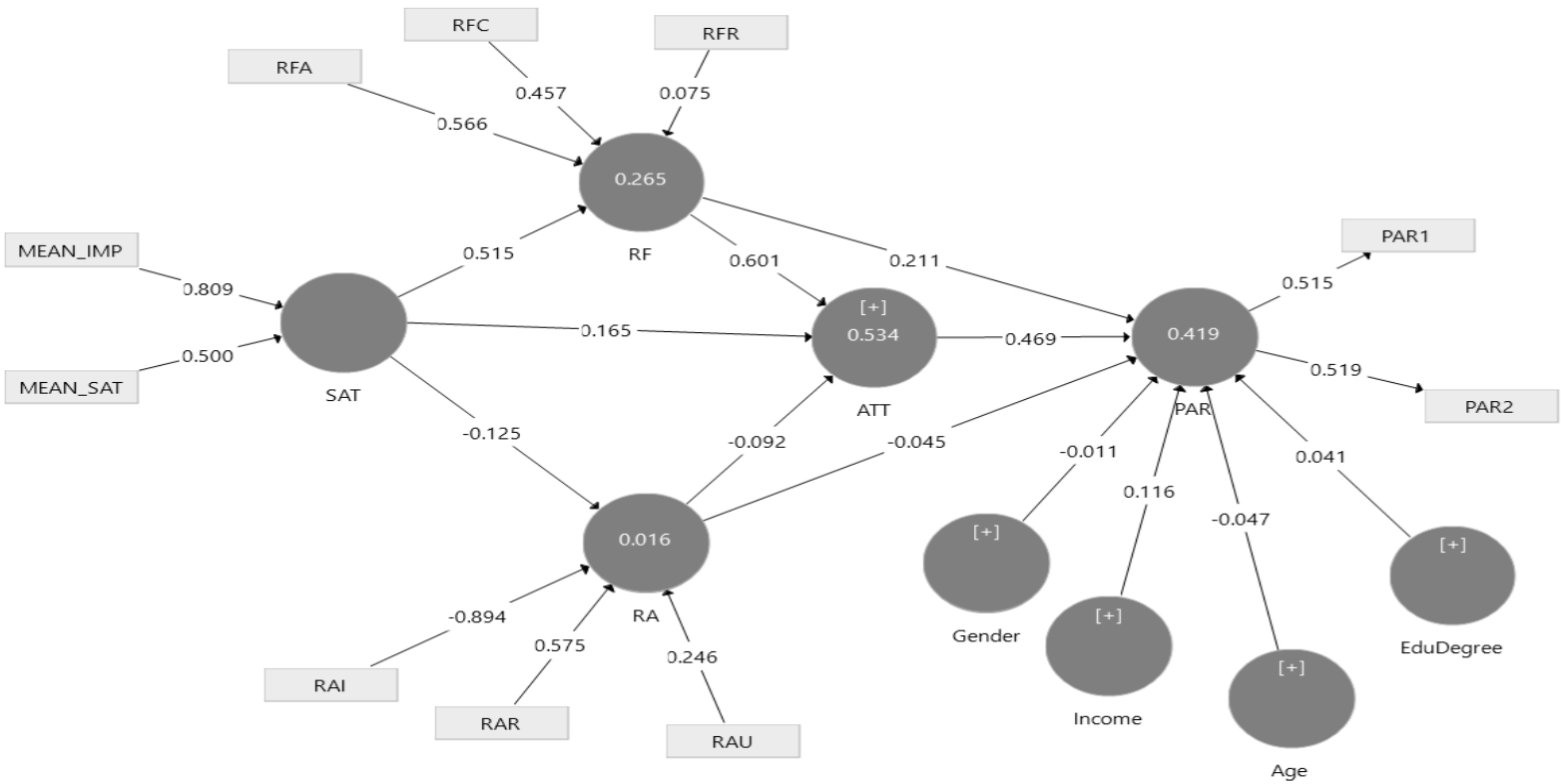

Figure 5.4.2 Second-stage PLS Analysis

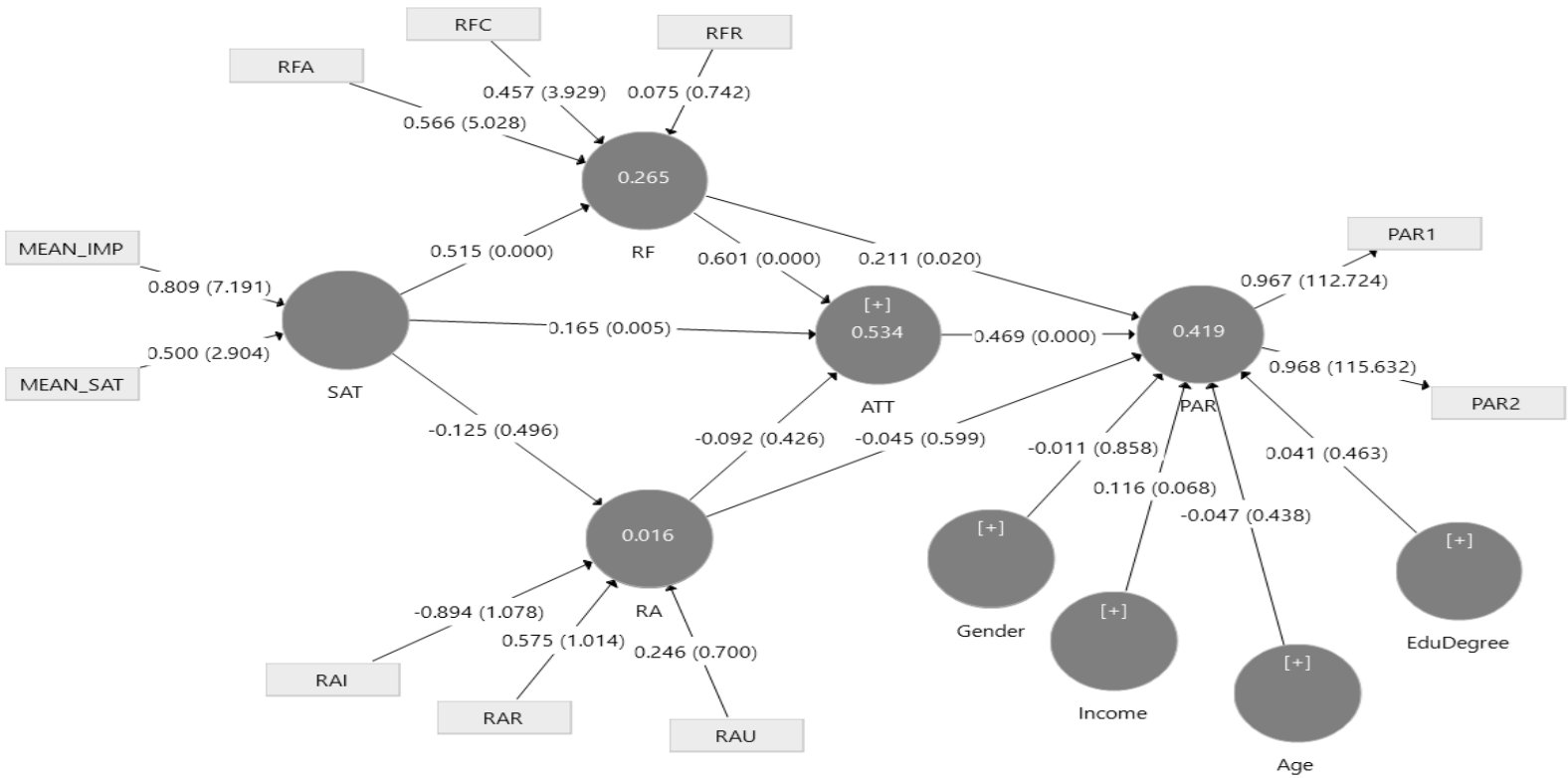

Figure 5.4.3 Second-stage Bootstrap Analysis

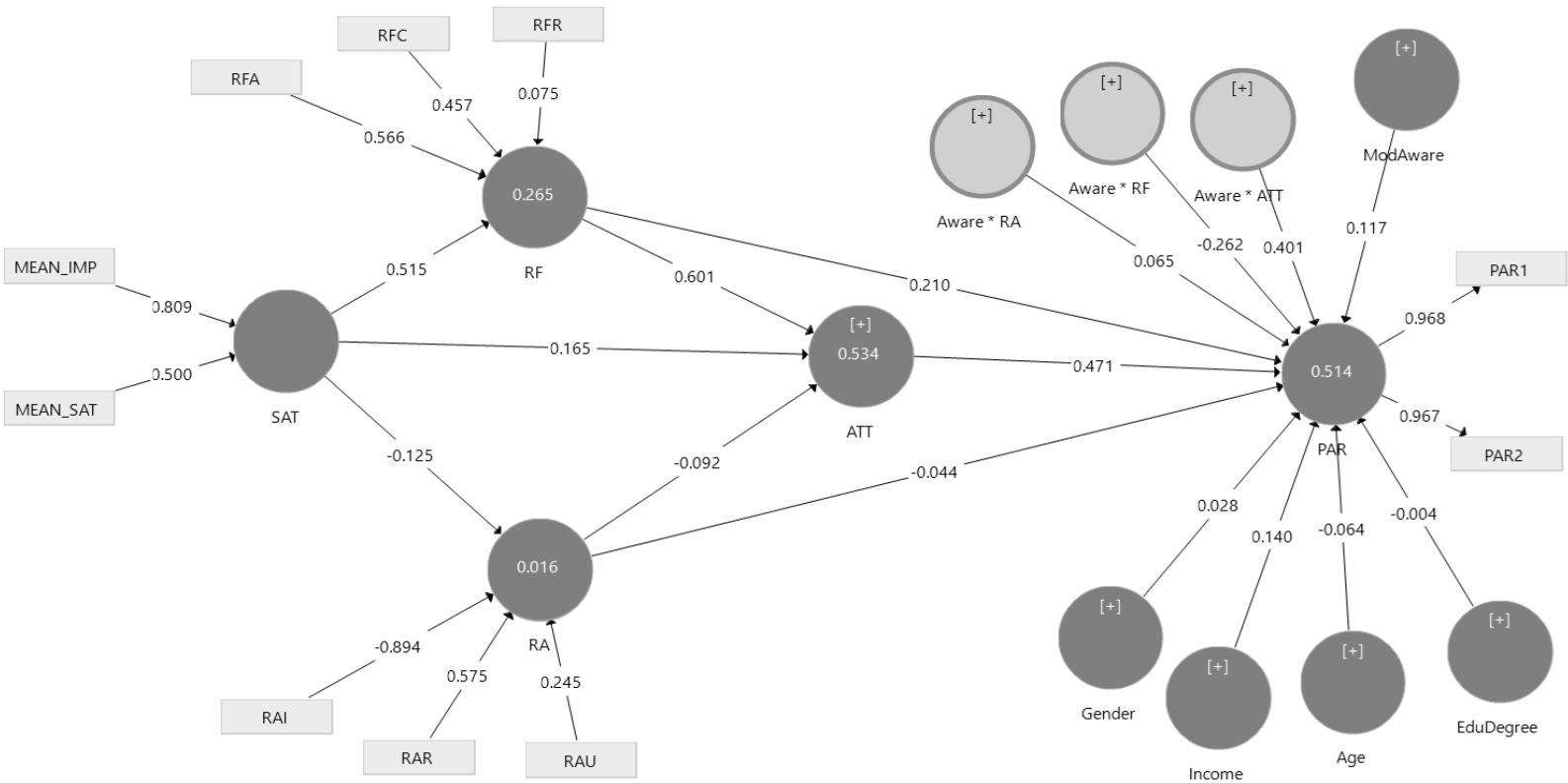

Figure 5.4.4. Moderation Analysis

Abstract (Korean)

흔히 기술 부분에 너무 치중했다는 이유로 스마트시티 접근방식은 시민을 스마트시티 발전의 중심으로 목표를 전환했다. 이른바 시민중심 스마트시티 접근법은 시민들의 요구에 부응해야 하는 '시민을 위한'과 시민들의 참여를 유도하는 '시민과 함께'라는 두 가지 특성을 가지고 있다. 하지만, 이전의 연구들은 현재의 스마트 시티의 구현이 시민들의 실제 필요성과 맞지 않는 경우가 많다는 것을 보여주었다. 또한, 대부분의 선행 연구는 스마트 시티 이니셔티브의 이점과 스마트 시티 이니셔티브를 사용하는 시민에게 영향을 미치는 요소에만 초점을 맞추고 있다. 동시에 스마트시티 이니셔티브에 대한 시민들의 시각과 참여의향과의 관계를 다룬 연구도 일부에 불과했다. 이에 본 연구는 시민들의 만족도를 살펴보고 시민 중심의 스마트시티 이니셔티브에 대한 참여 의도와 그 간극을 해소하기 위한 관계를 분석한다.

자료는 2021 년 5 월 초 자카르타에 거주하는 사람들의 대상 응답자와 함께 온라인 설문지를 통해 수집되었으며, 조사 결과 187 개의 데이터가 접수되었다. 데이터 정리 및 준비 중에 데이터셋에서 제거된 데이터는 9 개였으며. 마지막으로, 총 178 개의 유효한 데이터가 분석에 사용되었습니다.

분석 첫 부분에서는 중요도 및 성과분석(IPA)과 고객만족지수(CSI)를 활용하여 자카르타의 기존 스마트시티 이니셔티브에 대한 시민들의 만족도를 파악하였다. 두 번째 파트에서는 행동추리이론(BRT)을 이용한 스마트시티 이니셔티브 참여의향 예측 변수들 간의 관계를 조사하기 위해 부분 최소제곱구조 방정식 모델링(PLS-SEM)을 구현했다. 세 번째 분석에서는 시민들의 인식의 온건 효과가 논의되었습니다.

그 결과 시민들의 만족도가 58.19%로 낮은 것으로 나타났다. 이와 함께 IPA 분석에서는 기존 스마트시티 이니셔티브 각각에 대한 시민들의 인식을 설명하고 개선과 우선순위를 위한 세부 조사 결과를 제공했다.

PLS-SEM 분석은 '만족'이 글로벌 동기 '태도'를 통해 '의도'와 '참여의도'에 강하게 영향을 미친다는 결과를 낳았다. 반면, 본 연구에서는 '만족', '태도', '참여의도'에 대한 '반대의 이유'의 관계를 설명한 증거가 충분하지 않다.

마지막으로, 시민들의 '인식'이 '참여의도'에 대한 '태도'와 '참여의도'에 대한 '사유'를 부정적으로 강하게 완화시킨다는 결론이 나왔다. 반면, 시민들의 인식은 '참여의향'을 향한 '반대 이유'에 대해 어떤 온건한 영향도 미치지 못한다. 다른 발견, 연구 영향 및 한계도 이 연구에서 논의됩니다.

주요어: 시민의 만족도, 중요도 및 성과분석(IPA), 시민의 참여, 행동추리이론(BRT).

학 번: 2019-21210