

Smart City Maturity Level and Quality of Life Index in Manado City

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Abstract: *The concept of smart city has been the subject of increased attention and is now emerging as a new paradigm of smart city development and sustainable socio-economic growth. Manado city government is also one of the city governments that is very enthusiastic about smart city programs. With the vision and mission to make Manado Smart City, the city government in this case continues to race to prepare the factors that support the realization of smart cities. Therefore, this research aims to find out how the maturity level of smart city implementation in Manado City. In this study, a measurement model was adopted according to Garuda smart city framework (GSCF) to assess the maturity level of smart city concept. There are two main indicators for measuring smart cities, namely quality of life indicators and indicators of maturity of smart city development. The results obtained from the calculation of maturity level smart city the three enablers are at the integrated level, namely the city government invites all stakeholders in the city to implement a variety of comprehensive smart city plans. Manado City Human Development Index (HDI) also increased with the implementation of smart city plan program. The calculation of HDI in Manado city from 2016 to 2019 showed a significant increase of 1.97.*

Keywords: Smart City, Maturity Level, Quality of Life

1. Introduction

The concept of *smart city* has been the subject of increased attention and is now emerging as a new paradigm of smart city development and sustainable socio-economic growth. There is still no general consensus on the meaning of the term *smart city* or on what attributes describe it. However, there is broad agreement on the fact that *smart cities* are characterized by the widespread use of Information and Communication Technology (ICT), which in various urban areas helps cities make better use of their resources. [1].

Manado city government is also one of the city governments that is very enthusiastic about *smart city programs*. With the vision and mission to make Manado Kota Cerdas, the city government in this case continues to race to prepare the factors that support the realization of *smart city*. The application of *smart city* concept in Manado city with Smart Command Center provides convenience for the public who see information through the official website of the Manado city government. Smart Command Center in which there is information Monitor Food Prices (Taupang), Smart Weather Climate Forecast (Ricca), Call Center 112, and there are also that can be accessed through the *playstore* application namely community monitoring system (sitasya) [3]. The concept of Smart City is intended to facilitate all affairs with

the support of high connectivity from the utilization of Information Technology (IT) so as to help the city community manage existing resources efficiently and provide appropriate information to the community or institutions in conducting activities in *real-time*.

To be able to build a *smart city* that suits your needs, there must be a holistic and intact framework, so that what is built according to the needs of the city / district. But at this time the Manado city government does not have a network of information and communication technology that connects all agencies in the scope of Manado city government so that the service to the community is not maximum [5]. Smarter cities tend to have better resistance to external interference.

2. Method

2.1 Types and Variables of Research

This research is descriptive quantitative research conducted with surveys and questionnaires to the relevant agencies in addition to the literature study to provide the basis of assessment to be used. The reason is because the research contains problems that are reviewed from existing factors and then conducted analysis related to these factors to produce the concept.

Table 1: Research Variables

Variable	Sub Variables	Indicators	Source
Information and Communication Technology	Service	ICT services or applications used	[7]. [8].[9].[10]. [11]
		Online community service	
		Integrated apps	
		Service-based applications	
		Applications to be developed	
	ICT Infrastructure	Connect to a network	
		Internet <i>bandwidth availability</i>	
		Internet use in OPD	
	ICT Governance	The existence of <i>data centers</i>	
		ICT Organization	
		Policies or regulations on ICT	
		SOP related to the use of ICT	

		Human resources	
		ICT planning documents	
Governance	Government Directives	Integrated direction from the government	[12] .[13]. [9]
		The existence of the CIO	
		There is a CIO in the service	
		Types of approaches and strategies	
	Strategy	Strategy direction	
		Strategy formalities	
		Organizations that manage <i>smart cities</i>	
	Organization	There is <i>training</i> training	
		Documentation of roles and capabilities needed for organizations	
		The existence of management regulations	
	Process Management	Regulatory formulation	
		Ease of process	
		Clarity of information about the process	
		The existence of performance measurements	
Performance measurement	ICT scheme support in performance measurement		
	Performance measurement discussion		
	Public involvement in assessment		
City Regulations	City regulations applied		
	Dissemination of information about <i>smart cities</i>		
Human Resources	HR Management	Standard level of human education as a user of the system	[14] . [9]
		Standard user's ability to operate ICT	
		Sustainability training to maintain the capabilities of service managers	

2.2 Data Collection Methods

Data collection method is the steps of researchers to obtain data as a supporter of analysis. The process will generate data from government agencies that are structured. Data collection will be conducted with primary surveys and secondary surveys while data retrieval techniques in the form of questionnaires and interviews.

2.3 Sampling Techniques

Respondents who were selected in assessing the maturity level of the application of the concept of *smart city* in Manado city is Diskominfo Manado City Government, namely local government work unit which serves as the leading *sector* in implementing *smart city* in Indonesia. It is also contained in "Regulation of the Minister of Communication and Information No. 14 of 2016 concerning Guidelines for Regional Device Nomenclature in the Field of Communication and Informatics, where one of the functions of regional device organization (RDO) in the field of communication and informatics is to organize smart city information systems". So that in the selection of respondents is only done in the related office namely Diskominfo Manado City as the main organizer of the smart city program. The community in this case serves as a supervisor and cooperation in implementing and supporting the program plan that has been set by the government.

2.4 Analytical Techniques

a) Maturity Level Smart City

Maturity Level Smart City analysis is conducted to measure the extent to which the maturity level of the city (city government and other stakeholders) is effective, efficient, integrated, sustainable, and measurable to produce services that can improve the quality of life of its citizens.

Smart City Maturity Level has five levels, namely (1)*ad-hoc*, (2)*initiative*, (3)*scattered*, (4)*integrated*, and (5)*smart*. On an *ad-hoc* level, there has been no formal Smart City initiative. At the *initial* level, there has been a formal smart city initiative listed in the city's formal plan undertaken by the city government. At *scattered* levels, the city government invites various parties within the city to carry out various Smart City initiatives, but those initiatives are not guaranteed to be integrated with each other. This may be because there is no official forum to coordinate and there is no formal plan for Smart City. At the *integrated* level, the city government invites various parties in the city to carry out various integrated Smart City initiatives. At the *smart* level, cities that have achieved integrated conditions measure the performance of achieving targets and improving Smart City programs.

Each domain is given the same maximum score of 100% with a calculation scale of 1-5 (according to the smart city level) where each value increases at multiples of 20 and all aspects are considered to have an equivalent level of urgency. The score of each question that can be obtained from the survey is multiplied by the weighting of each question so for each domain is taken in value. Maturity calculation is done using Formula 1 [10].

$$Maturity\ Rating = \sum_{Dimension\ a}^{Dimension\ n} \left(\frac{Total\ Indicators\ Value}{Total\ Maximum\ Value} \times Weigh \right) [10]$$

Formula 1 Maturity Calculation

Furthermore, the overall value obtained from each domain is added and divided by the number of domains added. From the results of the assessment will then be known the level of maturity of the city. *Ad-hoc* has maturity level of 0-20%. *The Initiative* has a maturity level of >20-40%. *Scattered* has maturity level of >40-60%. *Integrative* has maturity

levelsworth >60-80%. *Smart* has maturity levelworth >80-100%.

b) Quality of Life Index

The Human Development Index (HDI) measures human development achievements based on a number of basic components of quality of life. As a measure of quality of life, HDI is built on a basic three-dimensional approach. These dimensions include longevity and health; knowledge, and a decent life.

3. Results and Discussion

3.1 Manado Smart City Overview

Manado *Smart City* is a city concept that has integrated connections in various fields to provide practical impact and efficiency in city management. All city problems ranging from congestion, garbage buildup, damaged roads, the state of the contours of the land of an area, and others can be in realtimeknown and sought the best solution quickly.In accordance with Local Regulation No. 8 of 2011, on The Long-Term Development Plan of Manado City in 2005-2025, basically Manado City has a vision of how, when, and what manado city will be like. With the point of the regional long-term development plan vision of Manado City and the current profile picture and strategic issues in Manado City, as well as taking into account the future conditions, the Vision of Manado City that has been set based on development plan year 2016-2021 is "Manado Kota Cerdas 2021". Manado City Government deliberately took "Manado Kota Cerdas 2021", in an effort to meet various needs of significant city change.

3.2 Maturity Level Smart City Manado

Measurement of *smart city* maturity level conducted in this study to see the extent to which the city government is effectively, efficiently, integrated, sustainable and measurable to produce services so as to improve the quality of life of the community.In this study it has been determined three enablers with 10 (ten) components, and 36 (thirty-six) indicators.From the results of the assessment will then be known the level of maturity of the city.

The results of the questionnaire obtained from the Department of Communication and Informatics Manado City then analyzed using *maturity level smart city*.Each domain is given the same maximum score of 100% with a calculation scale of 1-5 (according to the smart city level) where each value increases at multiples of 20 and all aspects are considered to have an equivalent level of urgency. The score of each question that can be obtained from the survey is multiplied by the weighting of each question so for each domain is taken in value. Maturity level calculation is done using Formula 1.

a) Information and Communication Technology

Technology is one of the key variables in *smart city* development. The integration between information and communication technology in project development can change urban layout because information and

communication technology is also the backbone of city services to facilitate and maximize city services

Table 2: Results of Maturity Level Calculation of Smart City Enabler of Information and Communication Technology

Variable	Sub Variables	Indicators	Total Score	Maturity Level
Information and Communication Technology	Service	ICT services or applications used	18	72
		Online community service		
		Integrated apps		
		Service-based applications		
ICT Infrastructure	ICT Infrastructure	Applications to be developed	13	65
		Connect to a network		
		Internet bandwidth availability		
		Internet use in OPD		
ICT Governance	ICT Governance	The existence of data centers	20	80
		ICT Organization		
		Policies or regulations on ICT		
		SOP related to the use of ICT		
		Human resources		
		ICT planning documents		

In the Information and Communication Technology enabler, the ICT Governance sub-variable becomes the sub-variable with the highest maturity level, which has a value of 80%, followed by the 72% Service and 65% ICT Infrastructure sub-variable but all three are at the same maturity level, namely Integrated.

b) Governance

Governance is defined how the city government manages the implementation of *smart cities*.

Table 3: Results of Maturity Level Calculation of Smart City Governance Enabler

Variable	Sub Variables	Indicators	Total Score	Maturity Level	
Governance	Government Directives	Integrated direction from the government	11	73,33	
		The existence of the CIO			
		There is a CIO in the service			
	Strategy	Strategy	Types of approaches and strategies	12	80
			Strategy direction		
			Strategy formalities		
	Organization	Organization	Organizations that manage <i>smart cities</i>	12	80
			There is <i>training training</i>		
			Documentation of roles and capabilities needed for organizations		
Process Management	Process Management	The existence of management	15	75	

	regulations	Regulatory formulation	16	80
		Ease of process		
		Clarity of information about the process		
		Performance measurement		
Performance measurement	The existence of performance measurements	ICT scheme support in performance measurement	16	80
		Performance measurement discussion		
		Public involvement in assessment		
City Regulations	City regulations applied	7	70	
	Dissemination of information about smart cities			

EYS = Expected Years of Schooling

MYS = Mean Years of Schooling

Based on the results of the calculation, it is known that the growth of HDI manado from 2016 to 2019 is as follows:

$$\begin{aligned}
 HDI &= \frac{HDI \text{ year } 2019 - HDI \text{ year } 2016}{HDI \text{ year } 2016} \times 100 \\
 &= \frac{(79,12 - 77,59)}{77,59} \times 100 \\
 &= 1,97
 \end{aligned}$$

The result of the calculation of Human Development Index in Manado city from 2016 to 2019 experienced significant growth of 1.97. There is a relevance between the application of Manado Smart City and human development index in Manado city since the application of smart city so that it can be seen that the application of smart city concept can affect the Human Development Index in Manado City.

In the Governance enabler, the City Regulation sub-variable becomes the sub-variable with the lowest maturity level which has a value of 70%, then followed by the Government Directives sub-variable 73.33%, Process Management 75% and the Strategy, Organization, and Performance Measurement sub-variables have the same maturity level ie 80%.

c) Human Resources

Human resources have an important role in smart city because human beings are resources that function as users, managers and as operators of applications / services.

Table 4: Human Resource Enabler Maturity Level Calculation Results

Variable	Sub Variables	Indicators	Total Score	Maturity Level
Human Resources	HR Management	Standard level of human education as a user of the system	12	80
		Standard user's ability to operate ICT		
		Sustainability training to maintain the capabilities of service managers		

The calculation result to see the maturity level of Human Resources enabler is at integrated level with a value of 80%.

3.3 Quality of Life Index

The Human Development Index (HDI) measures human development achievements based on a number of basic components of quality of life.

Table 5: Manado City Human Development Index 2016-2019

Year	HDI	LE	EYS	MYS	Expense
2016	77.59	71.31	13.83	11.02	13253
2017	78.05	71.34	14.11	11.03	13477
2018	78.41	71.52	14.12	11.04	13814
2019	79.12	71.80	14.14	11.26	14232

Information:

HDI = Human Development Index

LE = Life Expectancy

4. Conclusion

The concept of smart city that is being applied in Manado city can be seen from the results of the research is at a fairly effective level. From the results of the research obtained based on the results of questionnaires that were then conducted maturity measurements of smart city levels on three enablers, namely information and communication technology, smart city governance, and human resources in the communication and informatics office environment. The results obtained from the calculation of maturity level smart city the three enablers are at the integrated level, namely the city government invites all stakeholders in the city to implement a variety of comprehensive smart city plans. This is supported through the existence of institutions, such as smart city committees, covering most aspects of the city as well as approving smart city development plans that show a comprehensive plan. Manado City Human Development Index (HDI) also increased with the implementation of smart city plan program. The calculation of HDI in Manado city from 2016 to 2019 showed a significant increase of 1.97. There is a relevance between the application of Manado Smart City and the Human Development Index in Manado City so that it can be seen that the concept of smart city that has been applied can have an influence on HDI in Manado City.

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