Smart Healthcare Readiness Index Measurement In Bandung City

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ABSTRACT

In addition to having the potential to create synergies that enable large development opportunities for its population, a city can also produce various problems. As the 3rd largest city in Indonesia, Bandung is also inseparable from various problems that occur in all aspects of life. One of the problems faced is regarding health services. There are still many improvements that need to be made in health services to encourage Bandung City to implement a smart city solution, where smart healthcare is one of the dimensions implemented. After running since 2013, there were many achievements as well as obstacles faced in its implementation. This study aims to measure the level of readiness of smart healthcare in Bandung City. The method used in this study is a mix method by combining qualitative and quantitative approaches. The index of readiness for smart healthcare in Bandung based on this study is 62.83 or in other words there are still many shortcomings, but it is still within reasonable limits.

Keywords: smart city, smart healthcare, smart city index measurement, smart city Bandung, smart healthcare readiness index.

INTRODUCTION

In health services, Bandung is still experiencing some problems. According to the Head of Health Services at the Bandung City Health Office, Dr. Siska Gerfianti, MHKes., Health services in Bandung City are complex because in Bandung City there are 4 central vertical referral hospitals, namely Hasan Sadikin Hospital, Cicendo Eye Hospital, Dr. H. A. Rotinsulu Hospital and Unpad Dental and Oral Hospital. The distribution of hospitals in Bandung is uneven. From 34 hospitals in Bandung City, most hospitals are in the central and northern regions, so the density of patients in each hospital is different.

For example: RSUD Bandung and Al-Islam Bandung Hospital which are located in the eastern region of Bandung City get more crowded patient visits than other hospitals, this is made more severe by the arrival of patients from areas outside Bandung City, such as Bandung District, Sumedang District, Garut District and its surroundings. The characteristics of Bandung City as a buffer for other cities is also one of the challenges faced in health services, especially the problem of the availability of nursing rooms in hospitals. Thus, people who demand health services in Bandung City exceed the number of residents of Bandung City itself. In addition, complaints about poor health services are also one of the problems faced by Bandung City. Therefore, the concept of smart healthcare, which is the use of IT technology in helping administer health services is important.

RESEARCH OBJECTIVES AND QUESTIONS

The purpose of this study is to measure the readiness of smart healthcare in Bandung based on the opinions of experts and also generally answer the following questions:

1. How does the secondary data from best practices related to variables and indicators to measure Bandung smart healthcare readiness index? ⌊SEP⌋

2. How does the secondary data from Bandung related to variables and indicators to measure Bandung smart healthcare readiness index? ⌊SEP⌋

3. How much is the value of the variables and indicators of smart healthcare readiness in Bandung based on a comparison of what is felt, seen and understood by respondents in Bandung compared to the data from best practice? ⌊SEP⌋

4. Based on the index in point 3. how is the level of readiness of Bandung related implementation of smart healthcare? ⌊SEP⌋

5. How the result of word cloud visualization about people's opinions on the application of smart healthcare in Bandung?

6. What can be done by stakeholders of Bandung in order to implementing Bandung as a smart healthcare city?

THEORITICAL FOUNDATIONS

Smart Healthcare is a term built by two basic words, namely "smart" and "healthcare". According to dictionary.cambridge.org, "smart" means intelligent, or able to think and understand quickly in difficult situations. While "healthcare" means a set of services provided by the state or organization for physical and mental illness treatment. Viewed from a business perspective, "healthcare" is an activity or business providing medical services. While smart healthcare itself, many parties define it, including the following:

1. Smart health care includes services that use ICT solutions to increase access to health care, services that can remotely diagnose or prevent illness and other services that can enable effective health care at lower cost. Examples of these are telemedicine, connected medical devices and various methods to prevent the spread of illness [1].

2. Smart healthcare is the use of eHealth and mHealth systems and intelligent and connected medical devices. It also involves the implementation of policies that encourage health, wellness, and well- being for its

citizens, in addition to health monitoring and diagnostics as opposed to treatment [2].

3. According to Blue Stream Consultancy, "smart healthcare is defined by the technology that leads to better diagnostic tools, better treatment for patients, and devices that improve the quality of life for anyone and everyone." he key concept of smart health includes eHealth and mHealth services, electronic record management, smart home services and intelligent and connected medical devices [3].

4. Smart health (s-health) is the provision of health services by using the context-aware net- work and sensing infrastructure of smart cities [4].

From several definitions regarding smart healthcare, it can be concluded that smart healthcare is a health service that is assisted by information and communication technology and policies that support better service.

RESEARCH METHODOLOGY

This research was conducted with a mixed method approach. Mixed method involves combining or integration of qualitative and quantitative research and data in a research study [5]. Qualitatively, this research was conducted to explore so that an understanding of knowledge or phenomena or symptom can be obtained more clearly in order to determine the variables and indicators that can be used to assess the readiness of smart healthcare in Bandung City. Quantitatively, this research measures the value of smart healthcare readiness by using variables and indicators according to the model used. With these measurements, it is expected that this study can describe the characteristics of the implementation of smart healthcare in Bandung City. Briefly the characteristics of this study can be seen in Table 1.

Table 1. Research Characteristics

No	Characteristics	Type
1	Method	Mix Method
2	Purpose	Exploration –description
3	Type of investigation	Ethnographic
4	Involvement of researchers	Not intervening in data
5	Unit of analysis	Individual
6	Time	Cross Sectional

Whereas to achieve its objectives, this research was carried out in stages such as in Figure 1.
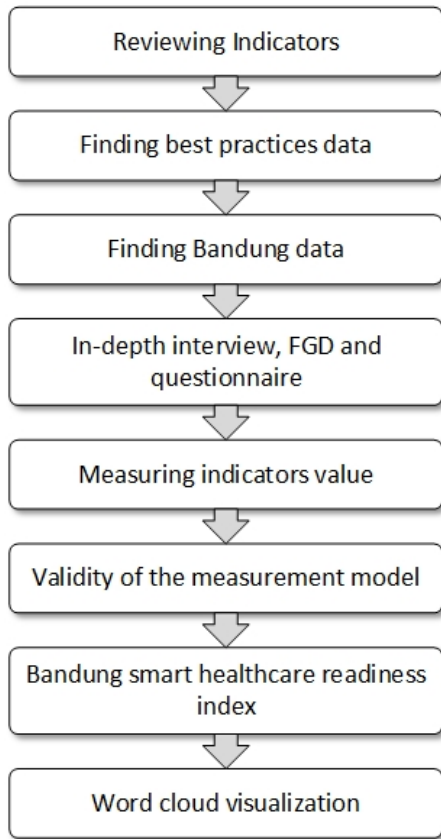
Figure 1. Research Stages

Based on Figure 1, the stages of this research are as follows:

1. Reviewing the smart healthcare readiness indicators produced in the study [6].

2. Search for best practice data on the application of smart healthcare in other cities, in this case Singapore. Best practice data is obtained from journal articles, Singapore government websites, company websites that have links to smart healthcare in Singapore, news portal websites and others. Singapore was chosen to be a best practice on the consideration that according to Juniper Research study in 2017 which stated that Singapore is the best performing smart city globally above London, New York, San Francisco and Seoul.

3. Search for data on the application of smart healthcare in Bandung by collecting documents and interviewing parties related to smart healthcare.

4. Conducting interviews, FGDs and distributing questionnaires to obtain opinions and values from the speakers regarding all indicators in the model used, based on the process of comparing best practice data with Bandung data and what they feel or know.

5. Calculate the value of each indicator based on the value that has been delivered by the respondents.

6. Validity testing, carried out for each indicator on the model used, with the aim to test whether the model used can really be used to measure the index of readiness for smart healthcare or not.

7. Calculating the value of smart healthcare readiness in Bandung city based on valid indicators.

8. To get an overview of people's perceptions of smart healthcare programs in Bandung City, represented as word clouds, that is, collections of words organized in space-optimized compact layouts in which font size encodes the frequency (or other relevance) value [7].

Population determination in this study used the Quadruple Helix model approach. According to [8], the Quadruple Helix model is a collaborative model of innovation or an innovation environment where users, companies, universities and public authorities work together to produce innovation. This innovation can be anything that is considered useful for partners in innovation cooperation, for example, technology, social, product, service, commercial, non-commercial, private sector, and public sector innovation. While the respondents in this study can be seen in Table 2 below.

Table 2. Lists of Respondents

No	Category	Respondents	Qty
1	Government	Department of Communication and Informatics Bandung, Department of Health Bandung, Regional Public Hospital of Bandung, PSC 119 Bandung	7
2	Business Player	Companies or Entrepreneur that engaged in the field of health system	11

3	Expert/ Researcher	Lecturer from Bandung Institute of Technology, lecturer from Telkom University, lecturer form Padjadjaran University.	5
4	User	Students, lecturers, entrepreneurs, professional and others.	13

SMART HEALTHCARE MODEL

Based on previous study that was conducted by [6], smart healthcare model can be summarized as shown in Figure 2.
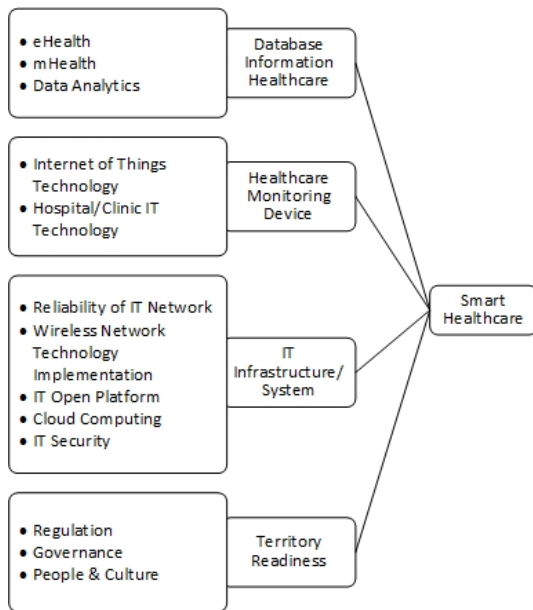
Figure 2. Smart Healthcare Model

To get the conclusion whether the model used can really be used to measure the index of smart healthcare readiness or not, before calculating the index value, the validity test of the model is conducted. Testing the validity of the data carried out in this study using the Pearson Product Moment correlation formula. This validity testing is carried out on the data that has been submitted by 33 respondents with the r table value is 0.3440. In other words, if the calculated r value is above 0.3440, then the data is declared valid. Conversely, if the value of r count is below 0.3440, then the data is declared invalid.

Table 3. Validity Test Result

Variable	Indicator	r_{value}	Validity
Database Information *Healthcare*	*eHealth*	0,577	Valid
	mHealth	0,794	Valid
	Data Analytics	0,763	Valid
Healthcare Monitoring Device	*Internet of Things Technology*	0,807	Valid
	Hospital/Clinic IT Technology	0,612	Valid
IT Infrastructure/ System	Reliability of IT Network	0,735	Valid
	Wireless Network Technology Implementation	0,619	Valid
	IT Open Platform	0,833	Valid
	Cloud Computing	0,808	Valid
	IT Security	0,871	Valid
Territory Readiness	Regulation	0,941	Valid
	Governance	0,870	Valid
	People & Culture	0,800	Valid

Based on the results of testing the validity, it can be concluded that all indicators in this study are stated to fulfill the validity requirements, namely the value of r count is greater than r table. Thus the model used can really be used to measure the index of smart healthcare readiness.

SMART HEALTHCARE READINESS INDEX RESULT

The measurement of the smart healthcare readiness index in this study was conducted by collecting and calculating the value given by each speaker. Based on the results of interviews, FGDs and questionnaires distributed to 33 respondents, the readiness index for smart healthcare in Bandung City can be seen in table 4.

Table 4. Bandung smart healthcare readiness index result

Variable	Indicator	Index
Database Information Healthcare	eHealth	62,53
	mHealth	56,21
	Data Analytics	56,76
Healthcare Monitoring Device	Internet of Things Technology	48,13
	Hospital/Clinic IT Technology	68,09
IT Infrastructure/ System	Reliability of IT Network	70,45
	Wireless Network Technology Implementation	68,94
	IT Open Platform	57,59
	Cloud Computing	60,87
	IT Security	64,72
Territory Readiness	Regulation	66,53
	Governance	67,18
	People & Culture	68,79
	Index	62,83

Based on Table 3. The index of readiness for smart healthcare in Bandung City is 62.83 or in other words the readiness of smart healthcare in Bandung City is still lacking, but it is still within reasonable limits.

CONCLUSION

The following are conclusions from the results of the research that has been done:

1. Smart healthcare's secondary best practice data in Singapore was obtained from journal articles, Singapore government website, company website that has links to smart healthcare in Singapore, news portal websites and others. All indicators of smart healthcare readiness have been obtained by each of the best practice data.

2. Bandung secondary data related to variables and indicators of smart healthcare readiness were obtained from interviews with parties considered competent, the official website of the Bandung city government (www.bandung.go.id), website smartcity.bandung.go.id, website portal news, journal articles and others. From the search results, an overview of each smart healthcare indicator in Bandung City is obtained.

3. The smart healthcare readiness index in Bandung is 62.83. The indicator with the highest value is the reliability of IT communication networks with a value of 67.00. While the indicator with the lowest value is Internet of Things Technology with a value of 41.58.

4. Based on the index obtained, it can be said that smart healthcare in Bandung City is in a condition where there are still many shortcomings, but still within reasonable limits.

5. The generated word cloud shows that the public, especially the people of Bandung, have not discussed much about smart healthcare and related topics. This is indicated by word cloud that is not relevant to the topic being searched for.

6. Building Bandung City into a city that is truly ready to implement the concept of smart healthcare has its own challenges. In addition to building infrastructure and technology, the success of smart healthcare (smart city in general) also depends on how the real role of all stakeholders. There must be synergy from all stakeholders, namely: government, academics, business people and the community.

ACKNOWLEDGEMENTS

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