

XSMART VILLAGE MATURITY ASSESSMENT MODEL

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Abstract

A smart village is a concept which refers to a set, series or even a bundle of services being delivered to a group of residents inhabiting that particular rural area and businesses effectively and efficiently [1]. Smart villages brings together leading scientists, thinkers and doers across the globe to help lift people out of rural poverty from the bottom up, using access to technology services as a catalyst for rural development. The preliminary problems of smart village implementations are related to the existing condition of a village, which shall also be its starting point. Therefore, through this paper we propose using maturity model measurement and assessment to understand the existing conditions of a village in its effort to adopt smart village concept. This paper will discuss the implementation of maturity level in Lamajang Village and Cipacing Village, West Java using Smart village Maturity and Assessment.

Keywords: Assessment, Maturity Model, Measurement, Smart Village, Indonesia

1 BACKGROUND

Smart village is the development and management of villages by the utilization of information and communication technology (ICT) to connects, monitors, and controls various resources in the village effectively and efficiently to maximize service to the villagers and also supports the development of a sustainable village [1]. In other words, smart village is an effective and efficient integrated service provided to the villagers.

Development of smart village has become a phenomenon in the last few years. This is shown from the data that belongs to the Worldwide Community by 2014 in which 1.3 billion world population residing in rural areas have limitations against access of electricity, education, health, clean water, waste management, and food security [2]. For example, three billion villagers still use dangerous and inefficient stove to cook.

Several villages in Southeast Asia had become a target in the development of smart village. One example is in the development of the smart village in rural Malaysia which started before 1960. The focus was the development of infrastructure for the villagers. The entire party was involved not only in the implementation but also in the planning process. In addition, Malaysia encouraged the movement of the 21st Century Village (21CV), which encourages the youth to remain in their villages and work and start a business there. The emphasized activities in this program are in the subsector of agriculture, tourism, forestry, and industry [2].

The entire smart village project involving rural people shows that basic ICT capabilities can be mastered in a

short time, and this helps improve the quality of life in various aspects. One example of the most affected subsectors by the presence of ICT is education. Teachers in remote villages can be trained through e-learning. The concept of the smart village proves that rural areas could potentially be successful economically. However, this concept is indeed expensive and requires competent management [2].

The smart village program contributes to the development of quality of life of the villagers by providing facilities and services of education, health, clean water, sanitation, nutrition, small medium enterprises development, income increase, security, and sustainable energy services. Through the smart village, governments and other institutions could have some innovative schemes to provide employment for the villagers and provide free access to services such as water, electricity, and so forth.

However, the existing implementation of the smart village is still restricted to the implementation and the measurement of the use of eco-friendly energy. Currently, both research and implementation of measurement of the maturity level of the village that compares the ideal conditions of smart village with the real conditions are not yet available. Therefore, the evaluation of the maturity of each village in Indonesia in implementing smart village in accordance with the characteristics of each village is needed.

Based on the above considerations, we develop the measurement of the level of maturity of the village called Village Model. The purpose of the rendered Xsmart Village Model is as follows.

- Understand the real problems of villages in Indonesia.
- Get more accurate knowledge about the solutions of villages' problems.
- Become a reference in conducting a maturity assessment of the villages in Indonesia in accordance with the used maturity assessment method. Such assessment is done by knowing the level of maturity of the village through the comparison to the ideal conditions.
- Help promote the solutions of the villages' problems.

2 XSMART VILLAGE MODEL

The maturity model is a framework that describes the behavior, practices, and processes to evaluate the ability of an organization [1]. In the smart village implementation, maturity model is a tool for evaluating the maturity level of the villages in Indonesia in accordance with the used maturity assessment methods.

The maturity model proposed in this paper adopts the characteristics of the villages in Indonesia by taking one example of village namely Lamajang village, Cikondang Sub-district and Cipacing Village, Jatinangor Sub-district in Bandung Regency. Such assessment is done by finding out the maturity level of the village through the comparison to the ideal smart village conditions and the current condition of the village. This maturity model is named Xsmart Village Model.

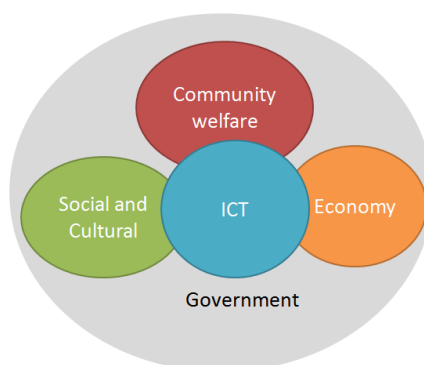


Figure 1. Xsmart Village Model

Xsmart Village Model's three main components are people's welfare, social and cultural, and economy. These three main components that are broken down into several indicators, such as food security, health, education, supply chain, transportation, social culture, security and disaster, local economy, tourism and household industry, and energy. The three main components coupled with technology and government as enabler component in the measurement (Figure 1). Table 1 is a list of indicators from three main components and enabler component in Xsmart Village Model.

Table 1. Xmart Village main and enabler components list

No	Indicators	References
Community welfare		
1	Food security	[3], [4], [5], [6], [7], [8], [9]
2	Health	[5], [6]
3	Education	[10], [11], [12]
4	Supply chain	[13]
Social and culture		
1	Infrastructure and transportation	[6],[14]
2	Social culture	[15], [16], [17], [18]
3	Security and disaster	[6], [19], [20], [21]
Economy		
1	Local economy	[6],[22]
2	Tourism and household industry	[23], [24],[25],[26], [27]
3	Energy	[28]
Enabler		
1	Government	[29]
2	Information and communication technology	[30], [31],[32], [33],[34]

Xmart Village Model has 5 level of maturity: Ad hoc, Initiative, Integrative, Optimize, Pioneer/Smart. Those level show how far the stakeholders in the village have been able to implement the concept of the smart village [35], [36], [37]. This model can be developed as a basis for the development plan for the village by the stakeholders.

Table 2 Xmart Village Maturity Level

No.	Level	Definition
1	<i>Ad hoc</i>	1. Low economic growth 2. Not so comfortable environment 3. Minimal use of ICT 4. Low level of government services and community welfare
2	<i>Initiative</i>	1. Low economic growth 2. Not so comfortable environment 3. Have started to use ICT in public services 4. Low level of government services and community welfare
3	<i>Integrative</i>	1. Medium economic growth 2. Comfortable environment 3. ICT-based integrated services 4. There is already awareness to improve public service
4	<i>Optimize</i>	1. Economic growth is heading higher 2. Comfortable environment 3. Public services already use ICT 4. Have a reliable and ICT-based government system and services
5	<i>Pioneer/ Smart</i>	1. High economic growth 2. Very comfortable environment 3. Ubiquitous ICT-based services 4. The village has leading innovations

3 METHODOLOGY

The development of Xmart Village Model is referring the implementation in other countries and the characteristics of Indonesian village to get the idea of ideal smart village for Indonesia.

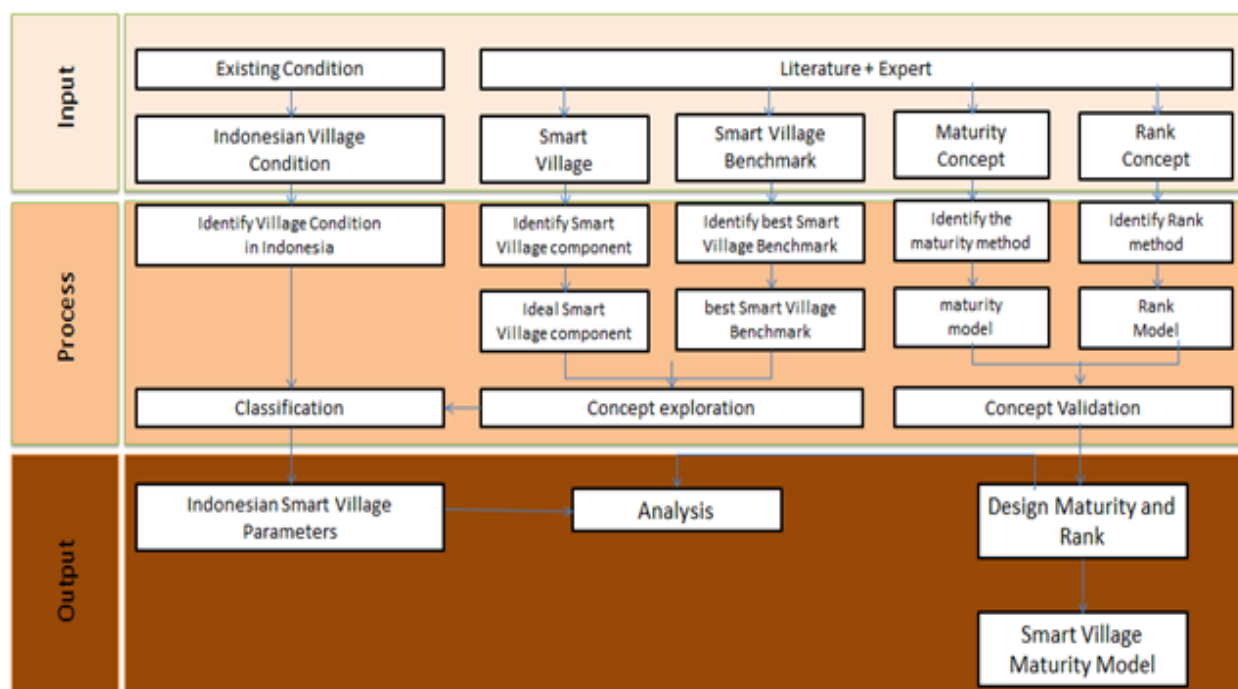


Figure 2 Xsmart Village Model development method

3.1 Weighting Method

The weighting method that used is normalization method. Normalization is a process of designing a database to get normal form [38] [39]. If a relation is in normal form, then it is also included in lower normal forms. For example, if a relation is in the form of 2NF, it is also in the form of 1NF.

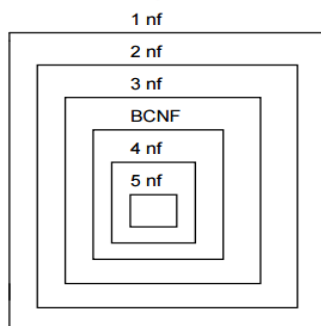


Figure 3 Normalization weighting

In the normalization processes, data is changed into table form, then analyzed and divided based on certain requirements into several levels. If the table has not met certain conditions, then the table needs to be broken into several simpler table to meet the optimal form.

Each parameter has weights as follows.

$$100 \div 12 \text{ Indicators} = 8.33 \%$$

Each indicator also has equal weight in accordance with the number of indicators in the same parameter.

$$8.33\% \div \text{all Sub- indicators}$$

3.2 Assessment method

Xsmart Village Model consists of these following domains:

- Human welfare
- Social and cultural
- Economy

- ICT as enabler
- Government as enabler.

Furthermore, each domain uses likert scale (1—5 according the level of smart city) and has maximum value 100%. All aspects also considered have equivalent importance. Each problem's score is obtained from the survey and multiplied by the weighting of each problem. Thus, for each domain will be retrieved points as follows [39].

$$\text{domain score} = \sum_{k=1}^n \text{score} * \text{weight}$$

After that, the score of each domain is added and divided by the number of domains. The score obtained will determine the maturity level of each city.

Table 3 Maturity Level

No.	Level	Score
1	<i>Ad hoc</i>	0-20
2	<i>Initiative</i>	21-40
3	<i>Integrative</i>	41-60
4	<i>Optimize</i>	61-80
5	<i>Pioneer/ Smart</i>	81-100

4 RESULT

The assessment process begin with gathering Xsmart Village existing data in Lamajang and Cipang. The data gathered through the interview process with stakeholders, resident and profil document of Lamajang and Cipacing. The data collected was analysed and calculated to produce gap condition between ideal and existing condition. This information will be used to proposed the next village development recommendation.

Currently, Lamajang and Cipacing Villages was stayed at Initiative Maturity Level, so todo the development in various sectors which affected well-being of community, such as implemetation of ICT in village's communityactivities. ICT could help community to promote the potential of village, getting information of village development and mapping existing condition as well as data base.

Table 4 Maturity Level of Lamajang and Cipacing

No	Category	Lamajang		Cipacing	
		Score	Level	Score	Level
Community welfare					
1	Food security	30,821	<i>Initiative</i>	32,478	<i>Initiative</i>
2	Health	38,396	<i>Initiative</i>	41,650	<i>Integrative</i>
3	Education	33,869	<i>Initiative</i>	38,446	<i>Initiative</i>
4	Supply chain	46,278	<i>Integrative</i>	46,475	<i>Integrative</i>
Social and culture					
1	Infrastructure and transportation	41,650	<i>Integrative</i>	44,982	<i>Integrative</i>
2	Social culture	42,389	<i>Integrative</i>	37,188	<i>Initiative</i>
3	Security and disaster	22,482	<i>Initiative</i>	21,329	<i>Initiative</i>
Economy					
1	Local economy	36,444	<i>Initiative</i>	39,047	<i>Initiative</i>
2	Tourism and household industry	28,152	<i>Initiative</i>	34,708	<i>Initiative</i>
3	Energy	44,047	<i>Integrative</i>	46,650	<i>Integrative</i>
Enabler					
1	Government	31,839	<i>Initiative</i>	40,724	<i>Integrative</i>
2	Information and communication technology	20,653	<i>Initiative</i>	20,653	<i>Initiative</i>
Sum		34.752	<i>Initiative</i>	36,195	<i>Integrative</i>

After making an assessment of the maturity, the maturity value assumptions do next if ICT have implement in village in the span of one year. This is done after the implementation of ICT infrastructure and HUMAN RESOURCE capabilities ready to use ICT in everyday life. In an assessment this time around, each category get additional indicators that describe the use of ICT in their respective categories.

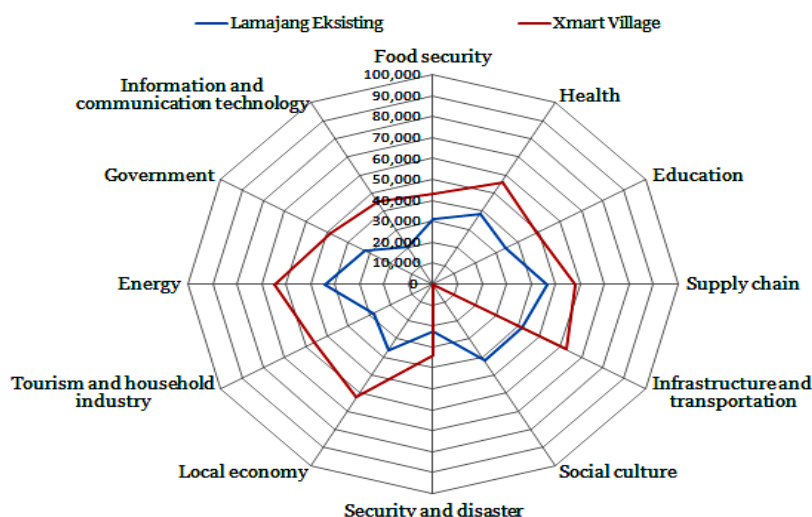


Figure 4 Lamajang Maturity Level

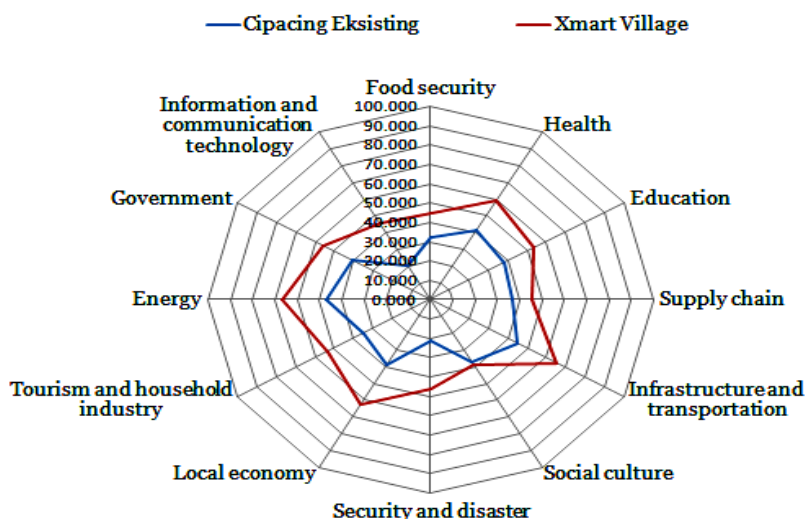


Figure 5 Cipacing Maturity Model

all the indicators value added experience assuming the development and implementation of information and communication technology in the period of 2 years (1 year for the preparation of good HUMAN RESOURCES as well as technology and 1-year period of implementation). This looks where the condition of the level of maturity of Lamajang and Cipacing is currently at level Initiative, be increased to the level of Integrative in the 2nd year of the ICT implementation in Lamajang and Cipacing.

5 CONCLUSION

Based on the research conducted, it can be concluded that the existence of the model village of maturity assessment can help reform the village to find out the condition of the existing villages both in terms of governance, human resources, and natural resources. This model can help in mapping the apparatus the potential and shortcomings of the village so that it can be developed some recommendations and plans towards smart village through the influence of the technology (including ICT) in everyday life.

6 ACKNOWLEDGEMENT

This activity is cooperation with XL telecom service providers as to assess the influence of information technology and in the development of digital construction of the village, which focus on the adaptation and implementation of the smart village in Indonesia.

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