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Information Technology Governance For Smart Village in Indonesia

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Abstract— Smart village can be used as a way to advance the villages in Indonesia. This study creates the concept of how information technology governance builds the smart village in Indonesia. The study conducted is a literature review, by collecting papers on smart village, document of village law number 6, 2014, and document of study on index of village development in Indonesia. Based on the literature obtained, then compiled information technology governance of smart village in Indonesia. The result is an information technology governance of smart village concept in Indonesia that places the Chief Information Officer (CIO) of village as part of the village organization structure.

Index— *information technology governance, smart village, village law, village development index, CIO of village.*

I. INTRODUCTION

Implementation of Information Technology (IT) for villages in Indonesia is still limited to the level of the village information system conducted separately from one village to another. Nevertheless there are several applications of information technology for village development. Village and Regional Information Systems (SIDEKA) developed by the Village and Regional Development Initiative Agency (BP2DK), Jogloabang.com, Mitradesa.id, and [Lumbungkomunitas .net](http://Lumbungkomunitas.net) are some applications to support district government.

Data from Ministry of Village, Development of Disadvantaged Regions, and Transmigration mention there are 73.093 villages in Indonesia, with the following categories: Very Disadvantaged Villages: 13.453 villages or 18,25%, Disadvantaged Villages: 33.592 villages or 45,57%, Developing Village: 22.882 villages or 31,04%, Advanced Village: 3.608 villages or 4,89 %, Independent Village: 174 villages or 0,24% [1].

Village category data shows how the level of village development. The Very Disadvantaged Villages is the least developed category of villages, while the Independent Villages are the most developed villages. Village development policy is governed through village law number 6, 2014 (hereafter called village law). The direction of the village law policy mandates each village into an independent village. The information technology policy for village development is not sufficiently solved through the village information system. In the context of village development, information technology should act as an enabler in order to achieve organizational goals [2].

This study discusses how to govern the villages in Indonesia in order to become a smart village. From the village

category data, the village prioritized to implement information technology governance (ITG) is a village with an independent village category. Smart Village to be achieved in this study are: Villages that can manage various resources effectively and efficiently; Villages that can solve village challenges using innovative, integrated, and sustainable solutions; Villages that provide infrastructure and provide village services that can improve the quality of life of their citizens;

From the above explanation, the research question that needs to be answered is: 'How is the concept of ITG for Smart Village in Indonesia?'

II. METHODOLOGY

This study uses the literature review to get a picture of: 1. Smart village advantages, 2. The problems faced by villages in Indonesia to a smart village, 3. Government policy in rural development. The description is used to create information technology governance (ITG) matrix to map the role of IT in supporting the creation of smart village.

The steps undertaken in this study are:

1. Literature review.

Identify the literature needed to develop ITG for smart village in Indonesia. For this purpose, there are three literature reviewed, namely: (1) eight papers that address the issue of smart village. This issue is used to determine the strategic policy of village development in Indonesia towards a smart village. (2) Concept needs to arrange smart village in Indonesia. The literature used is a guide on how to build a village called the village development index. The villages ranking in Indonesia based on village development index. The larger village development index has, the more successful the village is developed. (3) The village development in Indonesia. The legal umbrella used to build villages in Indonesia is Village Law no 6 2014. This law and its derivative rules are used to develop village stakeholder roles.

2. Using Weill & Rose ITG framework to compile ITG of smart village.

Indonesia does not have the concept of ITG used to build smart village. This study uses ITG Weill & Rose Framework to develop ITG of smart village in Indonesia. The first step taken to design ITG is deciding who to make decisions [3]. The ITG matrix is used to determine the people making decisions related to govern IT, while ITG decision is used to determine what decisions are taken. Both the people make decisions and what decisions are taken based on the literature review compiled at stage 1.

A. Smart Village

In the context of this study, Smart village is inseparable from the village development program. The study of smart villages in several countries emphasizes various issues and concepts. In India, there are several issues and concepts about smart village among them: smart village can improve the quality of life [4] [5]; smart village can act as catalyst for development in sector like health and education [6]; smart village make a better living [7]; smart village is ideal village plus digital village [8]; smart village make life going easier [9]. In Norway, smart village is used to enforce regulations on energy utilization. Each building must provide energy for itself [10]. In Malaysia, village development is done through the development of physical infrastructure to provide basic services for rural communities. One of the infrastructure development is electricity [11].

B. Village Development Index (VDI)

Indonesia is a country that has a large area and population. Based on data from the Central Statistics Agency, the population living in the village is 50.21% or as many as 119,321,070 people [12]. The welfare of the villagers is directly proportional to the village category. Thus the vast majority of Indonesians in rural areas still have low levels of wellbeing. The VDI is a village size determined by dimensions of social, economic, and ecological. These dimensions are then divided into several variables. These variables are then led to indicators for calculating the village development index.

There are 52 indicators used to determine the village category. These indicators divide the village into 5 village categories with a value scale of 0 to 1. Villages in Indonesia are categorized as follows:

1. Very Disadvantaged Villages = $\leq 0,491$
2. Disadvantaged Villages = $> 0,491$ and $\leq 0,599$
3. Developing Village = $> 0,599$ and $\leq 0,707$
4. Advanced Village = $> 0,707$ dan $\leq 0,815$
5. Independent Village = $> 0,815$

C. Village policy in Indonesia

Government legal umbrella to build village in Indonesia is village law no. 6 year 2014. This village law defines what a village is and provides the basis for how the village achieved its objectives. Village is defined as a legal community unity that has territorial boundaries. The village authority has the authority to govern village government business and community affairs. The Village Law governs village government in achieving the village objectives, namely: forming a professional village government and promoting the economy of rural communities. To achieve village objectives, village apparatus is needed, consisting of the village executive institution, namely the village government and the legislative institution, namely the village consultative institution (VCI). The head of the village executive institution is the village head (Lurah).

To manage village wealth, the village law mandates to establish the Village-Owned Enterprise (Badan Usaha Milik Desa/BUM Desa). Village-Owned Enterprise (VOE) is a village institution that has a level equivalent to the village head in charge of managing assets, services, and other businesses for the greatest welfare of the village community [13].

III. SMART VILLAGE ORGANIZATIONAL STRUCTURE

The structure of the village organization based on the village law states that the head of a village is the village head. The institution parallel to the village head is a village consultative institution. The village law does not explicitly mention that VOE institution is within the village organization structure. However, VOE is formed through village consultations between the village head and village consultative institutions. Based on the organizational structure of the village law is designed smart village structure organization as follows:

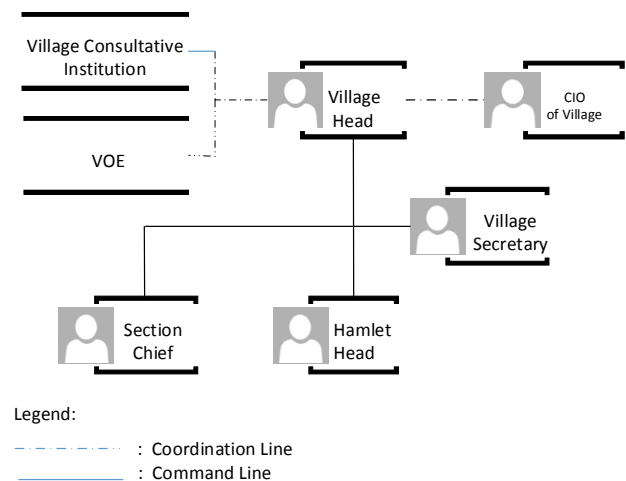


Figure 1 Smart village organizational structure

There are new institutions not previously discussed in Figure 1, such institutions are: village secretary, section chief, and hamlet head, and Chief Information Officer (CIO) of village. The village secretary is the assistant village head who serves the administrative duties of the village government. Section chief is the assistant village head who serves the duties of the working areas of the village. There are usually several areas of work in the village, such as development, finance, government. Hamlet is a smaller area within a village. The head of a hamlet called the hamlet head is the assistant of village head who serves as a leader in building his territory. Chief Information Officer (CIO) of Village is a new institution placed on the village organization structure. There have never been villages in Indonesia that placed the CIO of village in the village organization structure. This study places the CIO of village within the village organizational structure in order to design ITG for smart village.

Today the CIO is required not only to be a leader in IT utilization, but also to be an intermediary between the IT department and the organization's business [14]. In the context of smart villages, CIO of village must understand the IT utilization necessary to build a smart village.

IV. ITG MATRIX

ITG Matrix is a matrix is used to determine decision-making by functions within an organization. The ITG matrix has a decision column, and an archetype row [3]. ITG matrix columns consist of: IT principles, IT architecture, IT infrastructure strategy, Business Application Needs, and IT Investment. Briefly, it can be explained that IT Principles is a

decision about the role of IT strategy to the organization's business. IT architecture is an integrated IT technical decision and also meets business needs. IT infrastructure strategy is the decision of the utilization of infrastructure whether centralized or share. Business application needs are decisions for application implementation, whether developed internally or purchased. IT investment is the decision to determine how much and what the IT investment priority is.

ITG's archetypes column consists of: Business Monarchy, IT Monarchy, Feudal, Federal, IT Duopoly, and Anarchy, which are sorted from the most centralized to the least

centralized. Business Monarchy is the most centralized approach. Decision Makers in Business monarchy can be senior business executives or CIO. Decision making in IT monarchy is done by IT executive or IT executive group. In a Feudal system a decision is taken jointly by units under the executive business or CIO. In the context of ITG village, there are no functions that play a role in the Federal System, IT Duopoly and Anarchy.

The meeting cell between the decision column and the archetype is the role performed by the decision function. ITG matrix for smart village is seen in table 1.

Table 1 ITG Matrix for Smart Village

	IT Principle		IT Architecture		IT Infrastructure Strategies		Business Application Needs		IT Investment	
	Input	Decision	Input	Decision	Input	Decision	Input	Decision	Input	Decision
Business Monarchy	Village Head, VCI	CIO of Village		CIO of Village	Village Head	CIO of Village			Village Head, VCI	Village Head
IT Monarchy								CIO of Village		CIO
Feudal			Hamlet Head, Section Chief				Section Chief, Hamlet Head, VOE		Hamlet Head, VOE, Section Chief	
Federal										
IT Duopoly										
Anarchy										

The arrangement of the matrix of smart village table 1 shows that there is an involvement between centralized and decentralized (hybrid). The IT principles decision comes from the village head and VCI, and then the decision-making is done by the village CIO. The IT principle input comes from the village head and VCI. The village head is responsible for running the village program, while VCI is responsible for rules used to run the program. How the input is translated into a decision of the IT principles is the authority of CIO village. IT architecture decision comes from hamlet head and section chief, while decision making is done by CIO of village. The hamlet head and the section chief understand how business issues are at the operational level. The village CIO has the authority to translate the business level of operations into a decision of it infrastructure. The IT Infrastructure Strategies decision comes from the village head and the decision-making is done by the CIO of village. Village infrastructure is a strategic problem for IT development, so the village head has the right to provide input which is then used by the Village CIO to make decisions. Business application Section chief and hamlet head understand how business processes occur at the operational level, so both have good ability to provide decisions come from section chief and hamlet head, then decision making is done by the CIO of village input. The input is then used by the CIO of village to make decisions in determining the needs of business applications. IT investment decision comes from VCI, VOE, Hamlet head, and Section chief, and the decision to determine the investment made is the authority of the village head. IT investment is a sensitive issue, thus involving almost all village institutions, but investment decisions remain in the village head's authority.

V. DECISION NEED TO BE GOVERN

Each function within the village organization has the authority to make decisions. These decisions may overlap, or are not related to each other. Both are potential for conflict. Overlapping decisions lead to IT disintegration. While decisions are not related to each other make it useless. Then the governance needs in decision making related to the utilization of IT. The decision of key IT issues taken by the functions in the organizational structure is described in the following table 2.

Table 2 Key issues for IT decision of Smart Village

IT principles	<ul style="list-style-type: none"> • The village head should understand the definition of smart village that will be implemented in his village. • The needs of the village to be smart villages must depart from the village issue and include local wisdom. • The CIO of the village translates all the needs for the village's smart development gained from the village head's understanding of village smart. • IT invested in the village should be an effective and efficient IT in accordance with village budget capability.
IT architecture	<ul style="list-style-type: none"> • Units under the village head: the section chief, the hamlet head is obliged to inventory IT needs, both for development and maintenance.

	<ul style="list-style-type: none"> • CIO of village translates business needs from the section chief and the hamlet head to IT architecture. • CIOs have the authority to set up enterprise architecture as the basis for IT implementation. • Any developed IT application should refer to enterprise architecture.
IT infrastructure	<ul style="list-style-type: none"> • The village head understands how the village organization's business processes, so the village heads are authorized to provide inputs to any infrastructure IT required by the village. • The CIO of Village translate input from the village head into IT infrastructure decisions.
Business Application Needs	<ul style="list-style-type: none"> • Section chief, hamlet head, and VOE in their respective areas of work, have the authority to provide input on what applications are required at the operational level. • The village CIO receives input from the section chief and the hamlet head to the business application decision.
IT Investment	<ul style="list-style-type: none"> • Coordination between the head village and the VCI has the authority to determine the IT investment plan • The section chief, VOE, and the hamlet head provide input IT investment plan according to problem domain encountered. • The decision to invest in IT is determined by both head village and CIO. • The decision of the village head related to the village business, while the CIO related to IT policy

VI. DISCUSSION

The effort to manage the village resources effectively and efficiently are the goal of the smart village. Information technology can be used as a tool to support the achievement of a smart village. The needs to realize a smart village with IT support in Indonesia are:

1. Awareness of village institutions

The village government must understand the potential of its resources and be able to manage the resources for the welfare of the village community. Through village discussions it is necessary to consider the support of information technology so that the village resources are managed effectively and efficiently.

2. Establish village committee to make information technology architecture of smart village.

Based on point 1, the next step required is to establish a village committee in designing and building information technology for smart village.

VII. CONCLUSION

Smart village is an alternative for the welfare of the village community. Not easy does not mean it is impossible. To start building a smart village, IT can be used as an enabler. ITG can be used as a tool for IT to be managed as an enabler to form a smart village. The step taken is to determine the role of decision-making of each village stakeholder. Then identify what decisions are needed to build a smart village.

Some future studies beyond this work are suggested: Whether the Village CIO's placement as part of the village government is a cost center or a profit center? The placement of the CIO as part of the village government should be the center of profit.

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