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Stage Maturity Model of m-Government (SMM m-Gov)

Improving e-Government performance by utilizing m-Government features

MASTER THESIS

Business Information Technology

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Management Summary

As the need of the government for improving transparency and accountability in various government services, the government is aware of the imperative of using ICT to support the interaction between government and citizens concurrently with other government initiatives. The government started to invest huge capital into infrastructure when they started the e-government project and gradually shifting from traditional interactions to provision of e-services.

The deployment of e-Government is expected to improve the quality of service and reducing time delivery to the citizens. As the availability of multi channeling services as well as high penetration of mobile devices in developing countries , the use of mobile technologies is consider to be comprehensive way to helps government accelerate their performance, as an addition to e-government, known as mobile government.

Objective

In this thesis, we propose a stage maturity model of m-Government (SMM m-Gov) to measures the performance of m-Government implementation as a complementary of e-Government to provide better performances of the government to deliver services to citizens. With the stage maturity model, the government can assess in which level are their position in current situation and how to go to the next level of maturity.

Methodology

SMM m-Gov was designed based on exploratory literature studies and theoretical analysis. Qualitative meta-synthesis method is used and validated with experts that are active in the field of e-Government. The model applied within case studies together with the maturity assessment tool to determine its applicability in real-life context.

Main Conclusions of SMM m-Gov

- The proposed stage maturity model of m-Government, consist of five incremental stages and eight maturity domains ranging from initial to full development, depicted in matrix model. The model is new in the field of m-Government and consider as the first mobile government maturity model with its two dimensions: stages and domains.

- The stage maturity model of m-Government offers a scientific framework for the e-Government and m-Government development process. It has shown the linkages and similarities between both of them.
- The SMM m-Gov addresses the m-Government maturity aspects in order to improve e-Government services by utilizing m-Government features, but the model also can be used in e-Government development, not limited to m-Government areas.
- The SMM m-Gov is a generic model and can be used in other developing countries, and can be adjusted to the needs and priorities of the government/organizations.
- The SMM m-Gov together with its maturity assessment can be used to measure in which level is the government in current situation and can be useful as a roadmap for government that are considering or already implement the m-Government project.

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List of Abbreviations

ACM	Association for Computing Machinery
e-Government	Electronic Government
G2B	Government to Business
G2C	Government to Citizens
G2E	Government to Employee
G2G	Government to Government
GPS	Global Positioning Services
ICT	Information and Communication Technology
IT	Information Technology
MCIT	Ministry of Communication and Information Technology
m-Government	Mobile Government
MMs	Maturity Models
PC	Personal Computer
PDA	Personal Digital Assistant
PI	Presidential Instructions
SMSs	Short Message Services
SMM m-Gov	Stage Maturity Model of m-Government
Wi-fi	Wireless Fidelity

PART I: BACKGROUND

~ Aim for success, not perfection. Never give up your right to be wrong, because then you will lose the ability to learn new things and move forward with your life. Remember that fear always lurks behind perfectionism ~

David M. Burns

1 Introduction

This chapter aims to provide an introduction and background information regarding the research area. The objectives are to understand challenges and introduce ways to overcome those challenges. Section 1.1 discusses the problem statement related to the development of e government, section 1.2 presents the research goal of the thesis, section 1.3 presents the research questions, section 1.4 describes the research method used to answered the research questions and section 1.5 presents the outline of the thesis.

1.1 Problem Statement

With the growth and spread of the use of information technology in the society, changes may appear in government institution to improve services to the public. The government has realized that electronic service channels were not successful and move slowly, they are now searching for an ideal mix of channel to be able to fulfill citizens' needs and to give citizens choices to use as many channels as possible, including the cheapest and the fastest ones. Therefore, the government needs to meet the demand and transform their activities to increase the efficiency and effectiveness as well as decreasing cost of transaction and time used. [1, 2].

In developing countries where internet access rates are low but mobile phone penetration is growing rapidly, has triggered the government to develop m-Government as an addition to e-Government [3]. The development of e-Government has begun since many years ago in many countries, some are successful, and some are still being developed, while m-Government nowadays, is in the early stage of development and may define as a new strategy to utilize all kinds of mobile devices, applications and services [4]. M-Government provides the additional features for the integration and exchange data communication, especially for the countries that have made a lot of investment in e-Government implementation. The synergy between both of them may become a new method for the interaction and communication between governments and citizens [5].

In short, e-Government is a general term describing the use of information and communication technologies (ICTs) to facilitate and improve the activities of government to deliver information and services. It concerns to the back-end process, by improving the government administration process, and front-end process, by building interactions with the citizens and to deliver services. In the other hand, m-Government is the extension of e-Government platforms, it used mobile technologies to improve

their back-end processes as well as the front-end processes to be able to interact with the citizens and fulfill their needs.

Similar to other countries, the Government of Indonesia has a national strategy and policy to develop ICT and to deliver transparent and good services to the citizen. The e-Government developed with a long terms evolutionary framework over five phases. A lot of effort have been made, but the development is still in the phase 2 (presence) of the roadmap model [6] . Therefore, a new or modified strategy should be developed to accelerate the delivery of public services by various methods to greatly improve end user usability, decreasing transaction time and easy of navigation [7].

The initiative of e-Government in Indonesia has been introduced through Presidential Instruction (PI) no.6/2001 in 24 April 2001 about telematics which means that the government of Indonesia has to use Information, Communication and technology (ICT) to support good governance [8]. Moreover, e-Government is needed to support the government change towards democratic governance practice, to facilitate communication between central and local governments, to support transformation towards information society and to improve the productivity, efficiency, transparency and communication between citizens and governments.

To realize national ICT's vision, the Government of Indonesia established The Ministry of Communication and Information Technology (MCIT) in 2001 that has several responsibilities: coordinate and formulate national policies and strategies for ICT's development, increase the use of ICTs in people's activities and supervise the implementation of the national ICTs policy and development in Indonesia. MCIT is formally in charge of e-Government implementation by focusing on the development of ICT infrastructure, creating blue print of e-Government, action plan and strategy to achieve the success of e-Government implementation. Government of Indonesia developed five-phased roadmap of activities and provide strategies (five critical steps) to increase the level of maturity, for better e-Government [8]. However, until now, the realization of e-Government in Indonesia is facing a number of challenges as follows: low internet penetration, financial constraint, inadequate human resources, insufficient infrastructure, and regulation.

Moreover, based on the internetworldstats.com, per September 2009, Indonesia had 30 million users. Meanwhile, as the statement of the Director general of Post and Telecommunication – MCIT in the IPv6 Summit 2010 [9], the use of internet is increasing rapidly into 45 million users, while the user of mobile phone is increasing until 170 million users and expected to increase in the next following year. Half of

them are using mobile phone, which are capable to access the internet. In some developing countries, m-Government has the potential of delivering information on demand and creating real time communications to satisfy public needs. Therefore, Indonesian government has big opportunities to create synergy between e-Government and m-Government plans to accelerate and facilitate the citizen needs due to high penetration of mobile phone users within the country.

To support the successfulness of m-Government, stage maturity model is used to improve understanding and guide the improvement processes. There have been some researches for e-Government maturity model [10-12], but lack of research in m-Government maturity model with its specific characteristics. Therefore, in this thesis, a stage maturity model of m-Government (SMM m-Gov) is developed and validated.

To develop a construction of SMM m-Gov, existing model of e-Government implementation and the development of m-Government framework are reviewed [13]. We translated the stages within different e-Government models into one another and developed the m-Government stage model [14].

1.2 Research Goal

The main goal of the research is to propose and validate a stage maturity model for m-Government implementation process. The stage maturity model of m-Government is intended to measures the performance of m-Government implementation and to provide the roadmaps and recommendations for the future directions.

For the Government of Indonesia especially Ministry of Communication and Information Technology, this research aims to provide brief findings of conceptual model and recommendations of the implementation m-Government as a complementary of e-Government to simplify the service delivery through different tools. The findings of this particular research is expected to increase the awareness of the government to deliver the most efficient and effective service to the citizens.

On the other hand, this research also can be used by other researchers as an analytical tool to help measure the m-Government development and behavior with the opportunities and challenges behind it.

1.3 Research Questions

To be able to meet the goal, we formulated a main research question as follows :

'How can e-Government and m-Government be integrated to deliver government service in Indonesia?'

To guide the study, the main research question is divided into the following sub questions :

RQ 1: How to develop an improved model to understand the linkages between e-Government and m-Government?

RQ 2 : Which stages and domains can be distinguished in the m-Government maturity model?

RQ 3 : How can Stage Maturity Model of m-Government be measured and made operational?

1.4 Research Methodology

The research questions addressed on the previous subchapter are outlined into different research approaches:

1. Exploratory literature studies and theoretical analysis

In-depth literature studies were conducted to have a fundamental understanding of the research. The construction of the stage maturity model is based on literature study by using a qualitative meta-synthesis methodology to synthesize different e-Government maturity models [14]. This process follows the step in the meta-ethnography approach. The result is used as the basis for the design of the construct of SMM-m-Gov framework.

2. Interviews

The data gathering was conducted through interview using semi-structured interview. The participants should answer the questions regarding the maturity model and development of e-Government and m-Government implementation. The interviews were also aimed to gain general understanding of maturity model, its use and its relation to different theories and standards. The strength of the interviews for both the interviewer and interviewees, is the ability to explore the meaning of the questions and answers involved [15]. It can deal with a variety of subject at different levels of complexity. The conversational mode has lead to many interesting variations of conclusions and in many cases, at least one party learns from others.

3. Case studies

Case studies are good technique of doing research to understand a complex issue or to add strength of the experience from the previous research. Case studies emphasize detailed contextual analyses of a limited conditions and their relationship. In his book, Yin [16] defines the case study research method as an empirical inquiry that investigates a phenomenon within its real-life context using multiple sources of evidence, and the boundaries between phenomenon and context are not clearly evident.

In order to validate the final of SMM m-Gov in practice, case studies in two different types of government were conducted to learn about the phenomena and to measure its usability in real-life

environment. An assessment tool was developed to assess the maturity of the government of Indonesia. The assessment is combined with a selected semi-structured interview with the people involved in the e-Government project in the Government of Indonesia.

From its result, the cross-case analysis was conducted and several key points are analyzed, the usefulness of SMM m-Gov and their willingness to implement the model are also evaluated. How we get to those research methods as written above is by:

Data gathering

The data gathering was conducted through interview using a semi-structured questionnaire and document analysis. The participants should answer the questions regarding the development of e-Government and m-Government implementation. The primary and secondary resources are used to gather the data. The primary sources were derived based on published articles, reviews, books and the government reports to gain the essential data, and the secondary sources were taken from the interviews and case study results.

Data Analysis

The qualitative data were gathered from the analyses using interpretive research [17] and the qualitative meta-synthesis methodology. The process follows the steps used in meta-ethnography [18] that will be further explained in chapter 4.

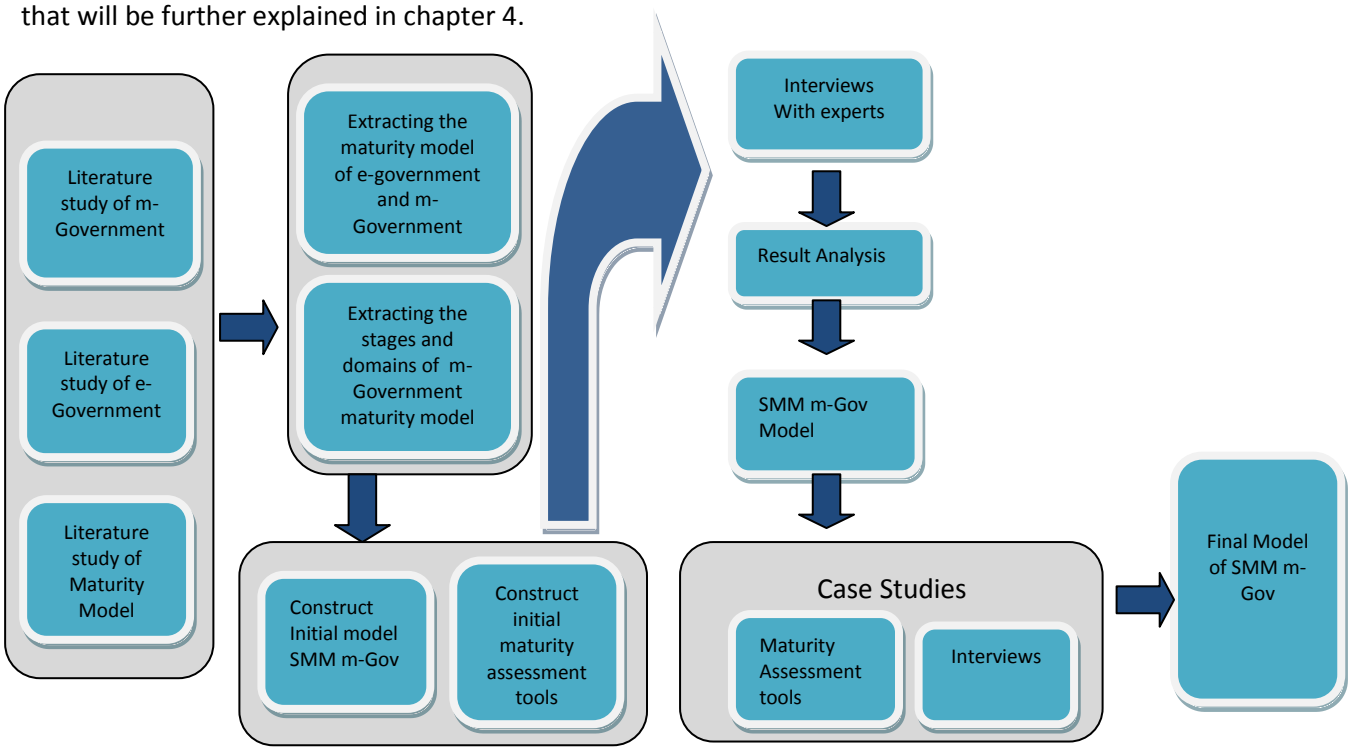

Figure 1: Research Framework

1.5 Thesis Structure

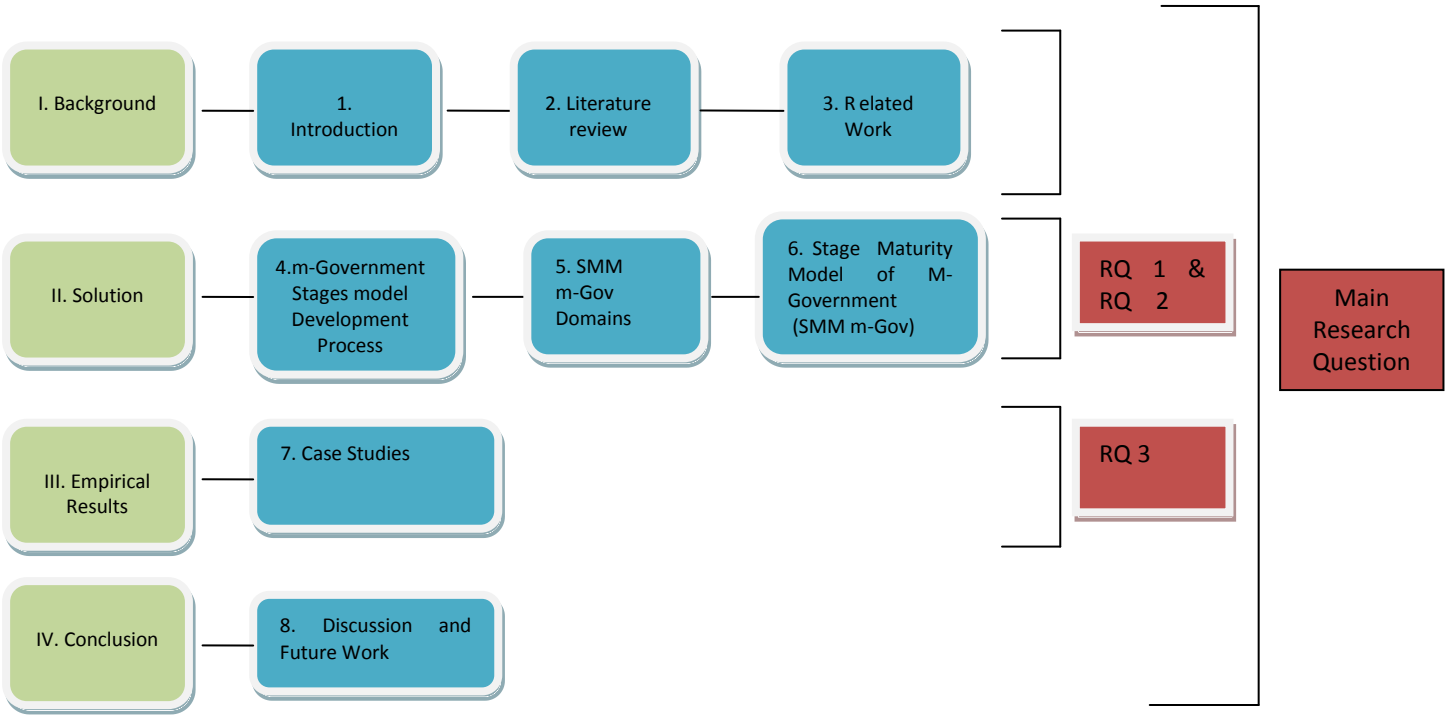

Figure 2: Outline of the Thesis

The remainder of this report is organized as follows and depicted in figure 2:

Chapter 2 presents the theoretical concepts of e-Government, m-Government and maturity model. The subchapter describes the present situation, challenges and the problem behind it. It also discusses what is a maturity model and how to implement it in m-Government areas.

Chapter 3 describes the available maturity models for e-Government and m-Government. There are seven existing maturity models reviewed in the fields of e-Government and three maturity models in the fields of m-Government. The maturity models come from different perspectives and points of view based on the research of individual researchers, consultant companies, international institutions and governments. These all models were reviewed for their context and applicability to propose a new model.

In Chapter 4, the construct of the Stage Maturity Model of m-Government (SMM m-Gov) is proposed. The chapter describes the development process of the construct and defines the maturity stages of the model.

In Chapter 5 we analyze the construct of the initial domains of the SMM m-Government, together with the validation process of the first initial model.

Chapter 6 defines and validates SMM m-Government model together with the maturity assessment tools used during the case studies.

Chapter 7 outlines the case studies to validate the research. Further interview with experts was conducted to generate rich understanding and extracting the data to validate findings. The case studies were used to validate the research in practices with the maturity assessment tools (see Appendix C). It presents general observations and analyzes the cases according to the maturity stages and maturity domains. This chapter also identifies the processing of the results, how the model works in real-life settings.

Chapter 8 presents the conclusion of this research, how the research questions are answered along with the recommendations, limitations and how these limitations could become the basis of further research.

2 Theoretical Foundations

This chapter gives an explanation and the situation of the current e-Government and m-Government services as well as several important definitions. Section 2.1 discusses the definitions of e-Government, the types of e-Government services and the implementation specifically in Indonesia. Section 2.2 defines the mobile government, and discusses the strengths and the challenges of m-Government implementation and followed by the discussion on maturity models in section 2.3. Section 2.4 presents the conclusion of this chapter.

2.1 E-Government

During few decades, government in all over the world has tried to take advantage of information and communication technologies (ICTs) to improve governmental administration and services. Increasing use of ICTs is leading to transformational shifts in public policy, to their processes and how they functioning. Electronic government is developing as one of the key channels to provide better services to the citizens as well as improving back offices processes and procedures in government operational and functions. These include items such as integration, service improvement and innovation, organizational, knowledge management and delivery services in terms of transparency, accountability, efficiency and effectiveness [19] .

2.1.1 What is e-Government?

Layne and Lee cited the definitions of e-Government as follows [10]:

“Electronic government refers to government’s use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and government entities. It has the potential to help build better relationships between government and the public by making interaction with citizens smoother, easier, and more efficient. Indeed, government agencies report using electronic commerce to improve core business operations and deliver information and services faster, cheaper, and to wider groups of customers.”

Broadly defined, e-Government is the delivery of government services through ICTs using the wired technologies to simplify and enhance the access and delivery of information and services to the public, including citizens, business partner, employees and other agencies or entities.

Furthermore, based on Moon [20], E-Government includes four major aspects: "(1) The establishment of a secure government intranet and central database for more efficient and cooperative interaction among governmental agencies; (2) web-based service delivery; (3) The application of e-commerce for more efficient government transaction activities, such as procurement and contract; (4) Digital democracy for more transparent accountability of Government."

E-Government is known as one of the channel to improve the communication and services from government to the public or citizens. Services can be delivered through a wide variety of channels, ranging from traditional channel to the electronic channel. Face to face meeting, for example direct communications at the counter. Telephony, for example call centers. Paper media, for example sending the forms to the government agencies and web-based technologies, with the use of technologies like internet, email, short message services (SMSs) and using devices to access the application such as personal computer, mobile devices, and digital television [21].

Users have a free choice to use different channels to access the services depending on their needs by suitable and available means of accessibility, flexibility, cost efficiency and effectiveness. On the other hand, the government should increase the value of its services by integrating their service process and delivery, introduction of new access and service channels as an opportunity to improve the service delivery to become more accessible and flexible [22].

2.1.2 Types of e-Government Services

There are primarily four types of interactions of government deployment [23, 24]:

1. Government to Citizens (G2C), refer to the interaction between government and the citizens, including dissemination of information to the public, basic services in various sectors, such as healthcare, education, agriculture, administration and finance, public access, and so on.
2. Government to Government (G2G), refer to the interaction between the agencies within the department (inter-government relationship) and interactions between different government level and attached agencies and bureau (intra-government relationship). G2G also refers to the standard the being used in order to communicate with each other and streamline processes.
3. Government to Business (G2B), refer to interaction between government and business stakeholders, including disseminations of rules, policy and regulations, within small, medium or large enterprises. From the perspective of business, it will be reducing cost, through improvement of e-procurement, increased competition and streamlined regulatory processes.

4. Government to Employee (G2E), refer to the relation between government and its employees, such as improving day-to-day functions, gives a training for the employees. This relationship also known as internal effectiveness and efficiency (IEE).

2.1.3 E-Government in Indonesia

In general, most of developing countries are lagging behind in e-Government development compared to developed countries. Like other developing countries, the Government of Indonesia, recognized the importance of establishing services to the citizens using electronic access. The government aim was to become more accessible and transparent to its citizens. Based on global e-Government survey conducted by united nations, for the e- government readiness, Indonesia was ranked 96th on 2005 and decreased into position 106th on 2008 [19].

Moreover, based on Furuholt and Wahid [25], there are huge disparities of e-Government implementation in Indonesia because of several factors, such as infrastructure, management and human factors [25, 26]. The government is facing a pressure to enhance the quality of the services to its citizens and to improve the dissemination of information; hence, the existing traditional government with the paper-based is left behind.

The transformation from traditional paper-based government services to electronic government has just started in the last few years. The terms of e-Government in Indonesia were officially introduced through the Presidential Instruction no 6/2001 regarding ICT and the implementation was followed by the presidential instructions no 3/2003 in July 2003 with the objectives to implement e-Government in all government institutions-central and local governments to improve transparency and accountability towards the implementation of good governance . The presidential instruction contains a national policy and strategy of e-Government development in Indonesia; therefore, MCIT develops a blue print and instruction to all central and local governments concerning e-Government implementation.

Central agencies are the backbones of government. They deliver core services, implement government policies and regulations nationwide, and create innovative solutions and strategy to drive change that leads to effective government. Before this instruction was introduced, local governments had already taken initiatives to develop their own e-Government but without any guidelines and procedures from central government as a regulatory body. This resulted in the adoption of e-Government at local government level to be lower than the central government. It also led to many different access technology processes being adopted by local government, which were not standardized.

Furthermore, as mentioned before, the development of e-Government in Indonesia is facing many challenges:

1. Human resources: the application of e-Government needs to be supported by the employees who understand technology. As the rapid development of information technology, the employees should be motivate and able to learn to manage the change. Moreover, Indonesia has severe problem regarding to the corruption and transparency of public services. The corruption practices need to be vanished first, so that government can deliver clean and transparency public services. In this point, e-Government is not just about technology but also about changing the culture.
2. Infrastructure: lack of public access and inadequate infrastructure is another challenges facing by the government of Indonesia. Indonesia consists of islands and separated by many seas, thus, making it harder to build public infrastructure spread evenly. Indonesia's archipelago geography has high degree of diversity in population density, level of access and internet awareness. Internet penetration is increasing rapidly, but the widespread and dispersed nature of internet users is much larger than internet subscribers in households. Two thirds of internet users used public kiosk or internet cafes to access internet and these users are concentrated in larger cities [25].
3. Management: in a society of large power distance and culture like in Indonesia, inequality in power distribution has occurred. Good management, strong leadership can support the commitment and unify different notion so that they can collaborate to lead to government initiatives.

To address the challenges listed above, the government should make an attempts to improve the quality of human resources by providing training for the government officers, commitment from government officials, restructured organization if needed, such as vanished the corruption and collusion, the standardized policy for the manual of e-Government implementation. Government should create an innovative strategy according to the needs and condition (citizen needs)

2.2 M-Government

As previously mentioned, there are different access channels to deliver services to the citizens. Government try to deliver services with various methods based on users needs and requirements. One

of them is the use of mobile devices to enhance government services and allow them to become more accessible and flexible.

With the advances in ICT and the demand from the public for the government to be more efficient and effective to deliver government services, it create opportunities for the government to offer new ways to interact with their users. These opportunities allow them to benefit from the various functions of information technologies, such as standardized format and tools, based on the requirements of users. One of the tools is mobile devices.

Mobile devices are now becoming part of our daily life. The advances in wireless and mobile technologies created a new channel or access method to deliver government services and improve efficiency. This access methods is called mobile government.

Mobile government is defined as the use of mobile and wireless technology for government administration and its delivery of information and services to the public. Moreover, m-Government may be defines as a strategy involving the utilizations of all kinds of wireless and mobile technology, services, applications and devices as a complimentary of e-Government for improving benefits to all parties involved in e-Government development, including citizens, business, employees and other institutions [7, 27, 28].

2.2.1 From E-Government to M-Government

M-Government and e-Government are not two separate entities. E-Government is using ICTs to deliver streamlined services and processes to improve activities of the government, whilst m-Government builds upon e-Government. M-Government provides an additional access tool to e-Government and its processes with the uses of wireless technologies and mobile devices such as mobile phones, Personal Digital Assistant (PDA), smart phone, net book, wi-fi enabled devices, and other mobile and wireless devices [4]. M-Government is the next direction of e-Government, it helps front-end processes as well as back end processes with the means of e-Government to accommodate the needs of users by interacting and delivering government services anytime and anywhere.

In m-Government development, there are two general phases to help develop the services. The first phase is to provide what is already available in a computer-based application through mobile devices. The second phase is to provide those services and applications, which are only possible through wireless and mobile infrastructure.

Moreover, according to Karadimas and Papantoniou [29], there are two types of m-Government services. The first one is called push services, in which the citizens received the information without any interactions and interactive services. Example of this type is mostly using SMSs services. This services working as a reminders and alerts, for example in case of emergency such as disaster. Status information, for example information about status of the application or exam grades. Other various notifications, for example notifications of renewal the passport or national identity cards. The second type is interactive services, in which there are two-way communication between the government and citizens. For example mobile parking and mobile transport ticketing, which using financial procedures for paying for the services, complains to the authority or giving a suggestions. For example, citizens can report the conditions of the roads, or a crime happened in some places, etc. These complaints or suggestions will be following up by the appropriate government officers to give a feedback to those problems they were notified off.

E-Government has four kinds of interactions as mentioned above; likewise, mobile government also operates in the same level of interactions: G2C, G2B, G2E and G2G. In this report, we mainly focus and G2C interactions concerning the services delivery that mostly refer to the citizens needs, but in general, all types of interactions also explained later in the next chapter, for example, the G2G in the means of integration stages, which is vertically and horizontally integrate between and within governments.

2.2.2 Why M-Government

As mentioned before in chapter 1, the use of e-Government and m-Government is to improve the back-end and front-end processes of government. Back office process is refer to internal operations in the government that support the core processes. The process is not open to the public, while the front office, is refer to the interactions between the government and citizens to provided information and services [19]. To contribute to the transformation of good governance, government should enhanced their back-end processes first to increase the transparency and resulting in overall quality of internal work processes.

There are numbers of attractive features creating compelling benefits for m-Government implementation, especially in developing countries and should greatly provide incentives to the government to adopt [4, 28] :

1. Number of mobile users: More and more people have mobile devices that able to access e-services and its contents. Higher penetration of mobile phone lead to higher number of accessing the government services
2. Mobility: enables citizens to access the content wherever they are, not limited to the wired connections with their desk computer.
3. Low cost: Use of mobile tools is easy and relatively low cost, which common people from lower to middle class can afford to have it, as the increasing of their needs of communication.
4. Easy of learning: The usage of mobile devices is easy and simple. The majority of citizens of all ages can use and access information with their mobile devices, especially when using mobile applications, this is more simple compare to computer-based applications.
5. Inclusiveness and remote area access: The ability of reaching rural areas. In which the infrastructures for wired internet or wired phone services is not yet set-up or difficult to develop. In the developing countries, m-Government may become useful methods to reach the citizens in disperse geography and remote area. It can reach different level of society and different zone of area.
6. Easy infrastructure setup: Mobile networks can be easily installed due to the simple architecture of mobile telephony. It useful in developing countries, where an infrastructure is an important issues.
7. Providing specific services: Some features are useful, such as mobile positioning or location based services.

2.2.3 M-Government Challenges

Besides the benefits of m-Government implementation, there are some challenges faced by the government in implementing m-Government. Major challenges of m-Government are mostly similar to the e-Government such as infrastructure, human resources and management. But there are some challenges specific to mobile technologies, such as security and privacy issues [30]. More specifically on these mobile issues, Alijerban described some challenges in m-Government implementations [28]:

1. Lack of mobile government laws, there are regulations, policy and rules that relevant to the use of mobile technologies, especially in the transaction stages, which using financial transactions. In some cases, legislative does not recognize a law in mobile documents and transaction at all [27].
2. Authentication and validity of mobile, looking at the importance of standard communications between or within agencies, the policy should developed, the authentications is not limited to a

specific tools. Moreover, for the specific mobile devices, such as mobile phones, user can easily changes their mobile phone number or mobile phones, which can caused the undeliverable information.

3. Integration technology for mobile accessing to government services, the communication channels in m-Government is not just about mobile phone, but also other mobile devices and wireless technologies. The higher the maturity stages, the more sophisticated tools needed. PDA, netbook, satellite, Wifi enabled devices, bluetooth, should also interact and possible to be integrated.
4. Security of mobile government services, security in wireless network is quite vulnerable and became challenging issues, including the data protections, email security, access of wireless tools, security management tools, etc.

Other challenges arise is an issues of compatibility and interoperability [27], there is also about technical difficulties regarding to the compatibility of the mobile systems with the existing e-Government systems, including the legacy system.

2.3 Maturity Model

Maturity models (MMs) in general are designed to assess the maturity based on more or less a set of criteria, including competency, capability and level of sophistication. MMs are developed to assist the organizations as a basis for evaluating and comparative degree for the organizations improvement [31].

zIn his dissertation, Tapia [32] explained that MMs describe the evolution of specific entity over time in organizations, so the organizations recognize which activities in each area and possess desire to achieve potential outcomes. He also argued MMs are descriptive and normative, but not prescriptive. It describes each maturity level without prescribing on how to get there.

Furthermore, based on research [14, 33, 34], there are some benefits of implementing a maturity model in government: First, MMs play crucial roles as a roadmap in guiding the governments in long-term plans. Second, MMs depict the conceptual guidelines about essential requirements in each maturity stage that enables employees to understand the government activities. Third, MMs can be used as communication tools to illustrate government potential capabilities. Public will understand in which levels are the government position currently, and government, in the other hand will enhanced their capabilities to improve the services to the citizens.

Moreover, there are some components that may or may not be present in the MMs as described by Haris in his thesis [35]: number of levels, description for each level, a general description of the characteristics of each level as a whole, numbers of dimensions or process area, numbers of activities for each dimensions and description of each activity at each maturity level. He also described an example of assessment framework of a maturity model, such as: a questionnaire with clear questions, a list of the dimensions the assessment addresses, a scoring scale, an explanation of how the model communicates the results and a list of potential interviewees for assessment.

In the following chapter, we will described several maturity model in the area of e-Government and m-Government. We also try to searching the literature about mobile maturity model, but until now, there is no specific scientific research of mobile maturity model available in the field, related to this thesis.

2.4 Summary

In this chapter, we provided definitions and overview of e-Government and m-Government together with the challenges and benefit that it provides. We started presenting the e-Government in general and specifically e-Government in Indonesia as an example of conditions in a developing country. The explanations followed by m-Government and the reason why we choose m-Government as further development of e-Government.

M-Government and e-Government are not two separate entities, but m-Government is developed as a complimentary of e-Government. The main difference is the use of mobile devices and wireless technologies so that the citizens can assess government services anywhere and anytime electronically.

Finally, we presented the nature of maturity model. The definitions, general characteristic of the various types of maturity model, why the government uses maturity models, and how to make the assessment framework of maturity model.

This above summaries serves as definitional background for the rest of the thesis. In the next chapter, we will explore related work, which attempt to show how different maturity models can highlight the features and using it as a basis to develop a new maturity model based on analysis of existing maturity models.

3 Related Work

This chapter discusses several approaches of e-Government and m-Government maturity models that are available in the scientific and practical fields. The chapter is organized as follows: Section 3.1 presents different stage maturity models of e-Government proposed by different researcher both in the scientific and practical fields. Section 3.2 presents the reflections of the seven e-Government maturity models. Section 3.3 specifically discusses the M-Government stage maturity models. Finally, section 3.4 presents the summary of the chapter.

3.1 E-Government Maturity Model

In this section, different e-Government maturity models are presented. Some of these were developed by individual researchers, government agencies and others by institutions and consultant companies. In this chapter, we explain each model briefly in the figure 3 below. For more detailed explanation of each existing model can be found in appendix B.

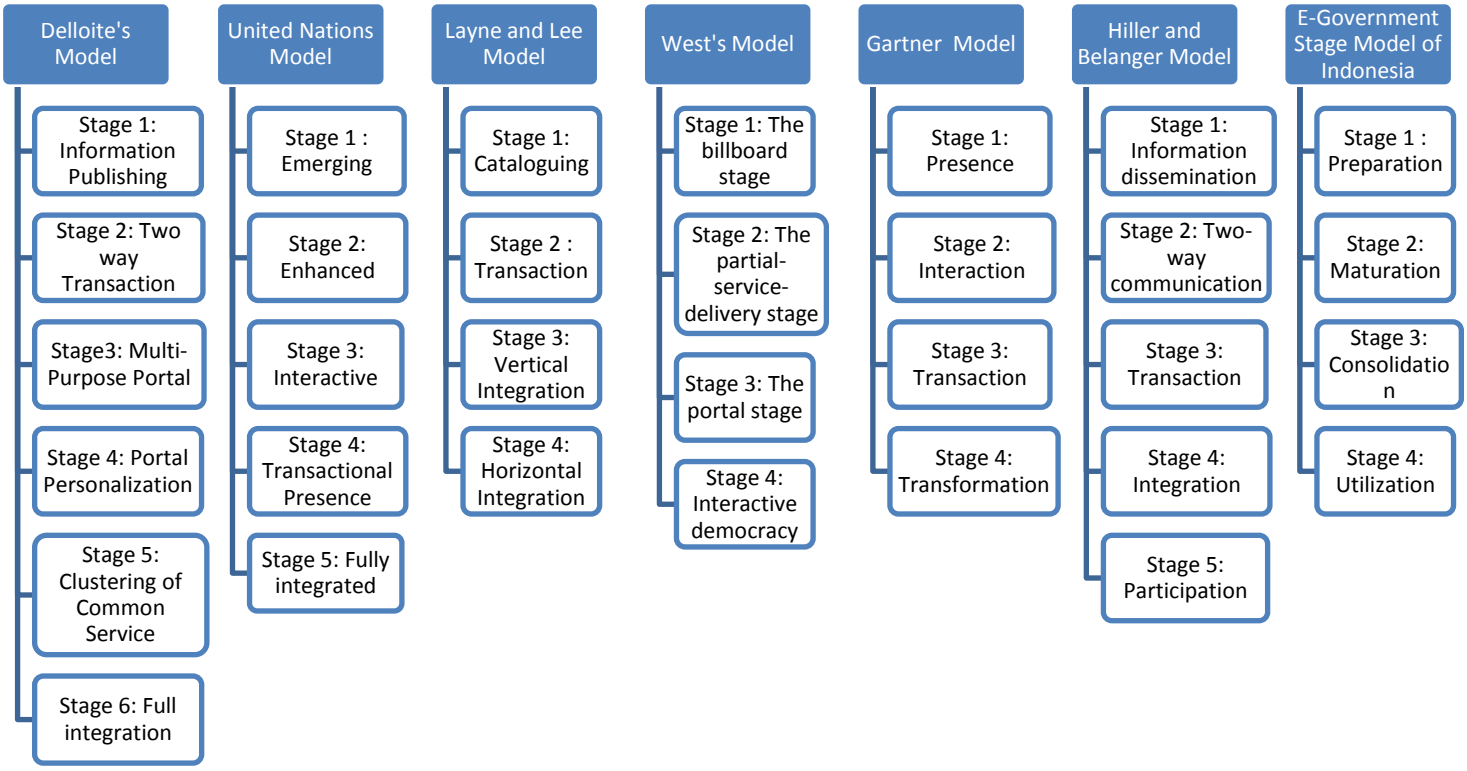

Figure 3: E-Government Maturity Model [10-12, 36-39]

3.2 Reflections of the e-Government Maturity Model

As described in appendix B, the widely used e-Government models presented are based on different point of view. First, we can see from the point of view of the researchers as explained by Layne and Lee, West, Hiller and Belanger and second is from the consultant companies such as Delloite and Gartner. Moreover, we also mentioned the e-Government maturity model from the United Nations, which is develop based on the research in various countries, especially developing countries. Followed by the Indonesian government, which has developed an e-Government stage model based on their own research and their practical implementation. All of the model address this theme from their respective view and conceptualize it in different aspects: social, technology, economic, political, etc.

Hiller and Belanger, West and Layne and Lee present a similar growth model. However, the authors combine their stages of growth model with the major types of electronic relationships between government and different level of constituents. First, government directly delivers the services to the citizen and government to the individual in the political or democratic process. It is categorized as G2C relationship. The second relationship is G2B, since the major portion of online transaction, could involved the business stakeholders, such as paying tax online. The third relationship is to another government agencies or employees, which they should collaborate to provide services to one another, as explained in the stage model as vertical and horizontal integration. This relationship is called G2G relationship.

As a new and rapidly growing field, some researchers extending the concepts and theories of e-Government to include mobile services with the aims to provide effective and efficient services and convenient access to the government services through mobile and wireless technologies [30, 40].

Moreover, there are limitations the number of research in m-Government maturity models. Some of the models we analyzed are describes in the following subchapters.

3.3 M-Government Maturity Model

As aforementioned, there are limited literature reviews about m-Government maturity model. Most of the research develops the model based on review of e-Government model [4, 13, 28, 30]. They develop the m-Government model for the needs of developing countries. Moreover, m-Government and e-Government are not two separate entities, in short, e-Government use all kind of technologies to deliver a service to the public, while m-Government is using mobile technologies as a complementary of the e-Government, provide convenience to the citizens in accessing real-time information.

Due to the limitations of the research related to m-Government maturity model, here, we could find and presented three m-Government maturity models that coming from the researcher point of view. The models it look similar with e-Government model, because all these models were constructed based on the development of e-Government that choose to utilize m-Government by looking at the rapid development of mobile technologies that could help the grown of e-Government implementation.

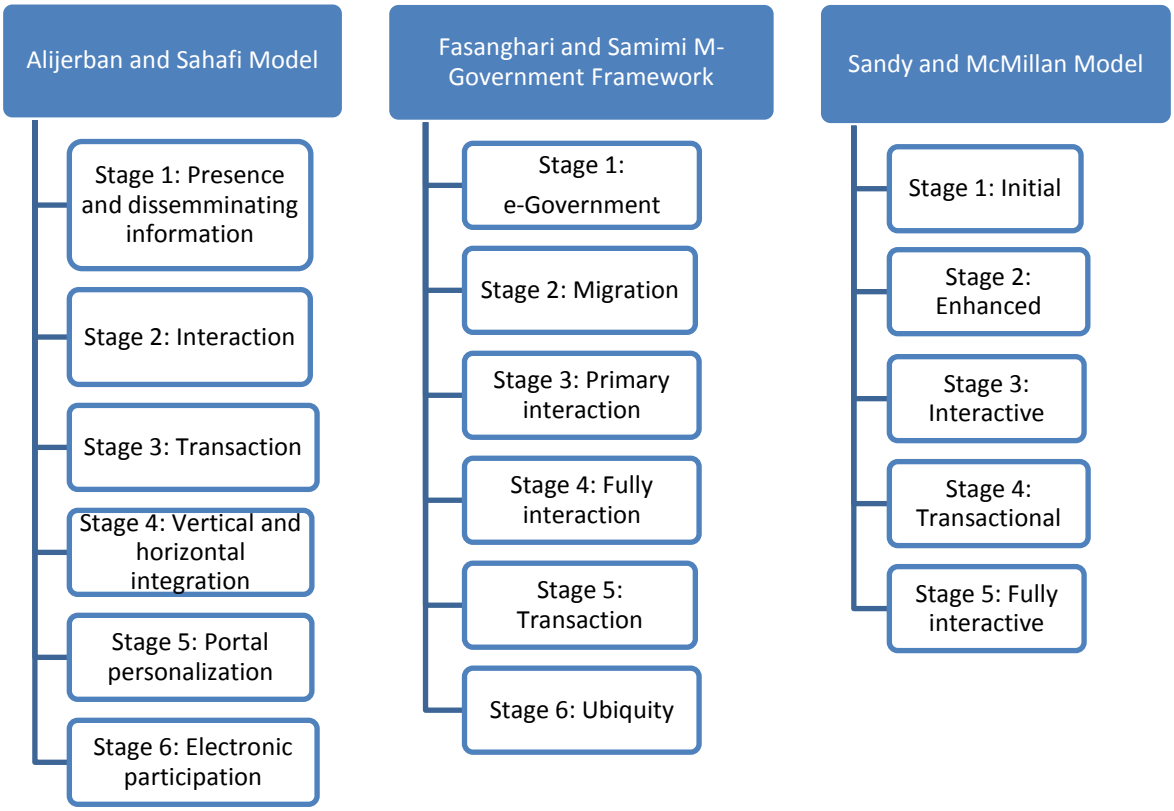

Figure 4: m-Government Maturity Model [13, 28, 40]

3.4 Summary

This chapter has examined seven different e-Government maturity models and three m-Government maturity models that are available in scientific and practical fields. The findings reflect from different perspectives from the fields of the individual researcher, IT consultant companies, international organizations and the government.

The seven different e-Government maturity models shown in section 3.1 together with m-Government maturity models explains in sections 3.3 are what we have used to create an unique SMM m-Gov. The new model will be explains in chapter 6, shown a development of e-Government that choose to utilize m-Government implementation.

In the next chapter, we will describe the development of the SMM m-Gov by using qualitative meta-ethnography methodology in order to compare, interpret, translate and synthesize different research framework and summarize all the model and resulting into the new findings of designing the SMM m-Gov.

All of the total 10 models described above are used to make a synthesizing of the stages model that will described in chapter four and the development of the domains model will be further explained in chapter 5.

PART II: SOLUTION

4 M-Government Stage Model Development Process

This chapter discusses the SMM m-Gov's initial stages based on extensive literature review. The development of the stages was based on the qualitative meta-synthesis with meta-ethnography approach. It was also validated by the experts through interview to ensure that SMM m-Gov is applicable to use in real-work settings.

Meta-synthesis is a way to comparing, interpreting, translating and synthesizing different existing qualitative research findings to systematically come up with a design framework so that they can be ready to used [14, 41, 42]. Developing maturity model systematically is not widely covered in either scientific or practical literature. In this chapter, we explained the steps of constructing the stages of the maturity model systematically by using meta-ethnography approach.

4.1 Qualitative meta-synthesis (meta-ethnography) methodology

Qualitative meta-synthesis is a technique for synthesizing the findings of qualitative research [18, 43]. It provides various methods and procedures to conduct qualitative meta synthesis with the different approach and different name [44]. In this research, a meta-ethnography approach by Noblit and Hare is used to synthesize the studies. The meta-synthesis methods should be interpretive, to help the readers understand the meaning by translating the studies into one another. The methods aim to explain the findings of a similar qualitative studies [41].

Based on Noblit and Hare, "Meta-ethnography is intended to enable: more interpretive literature reviews, critical examinations of multiple accounts of an event, situation and so forth, systematic comparison of case studies to draw cross-case conclusion, a way of talking about our work and comparing it to the works of others and synthesis of ethnographic studies" [18]. In short, the meta-ethnography is a method to interpret a qualitative finding that has been extracted by integrating and comparing different related qualitative studies, and resulting in the summation of findings.

In this research, we used meta-synthesis with meta-ethnographic approach to compare, interpret, translate and synthesize different research framework. To summarize all the models and resulting into new findings, seven-step meta-ethnographic approach is used. This approach is described as follows:

Step 1: Getting Started

The aim of this research is to study on stage maturity model of m-Government. The study is to identify underlying metaphors in the e-Government and m-Government stages model available in the literature to produce a common frame of the results.

Step 2: Deciding what is relevant to the initial interest or selects relevant studies

The current literature related to e-Government and m-Government maturity model was searched. Several different indexing engines such as Google Scholar, ACM Digital Library, Web of Science, EBSCO host, Scopus, were used to search the following combinations of terms : 'e-Government', 'm-Government', 'maturity model', 'stages maturity model', 'framework', 'level' and so on. The initial search, resulted hundreds of articles from all databases. For the first screening, the abstract reviewed one by one and for the articles that are not directly related to the e-Government or m-Government were removed. Second screening is to remove the articles with detail technical architecture. The third screening is to use citation analysis to support their argument and find other relevant literatures, books, white papers, government publication and so on.

Step 3: Reading the studies

After screening process, more than 50 articles were available to read on the subject. To identify the substantial concerns of the studies, comprehensive reading was carried out and the reading was repeated again to get further insight in the note and substantive parts. As a result, seven (7) studies about e-Government stages model and three (3) m-Government stages model were reviewed and details of each stage is described in section 3.1 and 3.2.

Step 4: Determining how the studies are related

Here, the various studies were investigated and by doing synthesis, each model was reviewed in detail to show the relationship between different studies. Each model was compared and contrasted to each other. After comprehensive reading, it shows the key metaphors, concepts and their relations. After understanding and analyzing all the models they showed that the developing stages of all the model is very similar, but with different perspectives. For example, the Delloite model is based on customer service perspective and defines the process as an evolution between governments and citizens. UN model focuses on web-based public services. Layne and Lee, Hiller and Belanger is based on integrated perspective combining technical and organizational feasibility. These two models were similar, while Hiller and Belanger model consider political participation as the last stages of the e-Government evolution. Gartner's model is concise and argues that transformation stage is the last stage, in which the government is doing a transformation process into integrated, unified and personalized service.

Alijerban&Sahafi and Fasanghari&Samimi models are based on general perspective with technological feasibility. Alijerban and Sahafi stage model is developed based on different research on e government stage model, while Fasanghari and Samimi model uses phases and stages, in which phase 0 means the first stage of the level.

Step 5: Translating the studies into one another – finding the linkages

To create a comparison to synthesize a comprehensive study, the concepts and metaphors identified in the previous step, are put into a translation, and the linkages between the models are identified. This study also compares both the concepts and metaphors and their interaction among different stages to find their corresponding relationship or link. Some analyses were used to identify other relationship between each stages of the model. For example, from the entire stage model presented in chapter three, the first stage of the models is to establish the websites and present basic information publishing online. Moreover, the corresponding relationship was found between the third stage of UN model and the second stage of Hiller and Belanger model, both these stages provide simple communication between government and the citizens, by email or downloadable forms.

Step 6: Synthesizing translation

Synthesis refers to the translation of the finding, its concepts and metaphors into one frame of reference. In this step, the relationships of different models are described within the table.

Step 7: Expressing the synthesis / presenting the finding

The synthesis of existing literature, sometimes biased toward the written word [44]. Other form may be preferable, for example via tables, charts, or diagram can be used to effectively illustrate the relationships. In this stage, the result of the research is presented in the table and will be further detailed in section 4.2 below.

4.2 Result of Meta-synthesis of the stage model

The seven models of e-Government and three models of m-Government as explained in Chapter three are qualitatively analyzed using meta-synthesized with meta-ethnography approach described in section 4.1. Followings are the detail explanation of the study.

4.2.1 Studies reviewed

After comprehensive and iterative literature search, seven models of e government and three models of m-Government were identified. Some similar models were developed by individual researchers and confirmed in the academic literature[10, 13, 28, 36, 38, 40]. Others came from the reports and white papers from government [39], consulting firms [12, 37] and international organizations [11].

As can be seen from Table 1 below the models published within last ten years, from 2000 to 2010 are based on different perspectives. The number of stages in a model, as described by the authors below varies from one another and may comprise of four to six stages.

Author	Year of Publication	Title	Description
Delloite Group	2001	The citizen as customer	Distinguish 6 stages of e-Government model based on service perspective (customer-centric model) and defines the process as an evolution between governments and citizens
UN	2001	Benchmarking e-Government: A Global Perspective	Provide 5 stages of e-Government model. Primarily based on analyzing web-based public services
Layne and Lee	2001	Developing fully functional E-Government: A four stage model	Identified 4 stages of a growth model of e-Government based on integrated perspective (combines technological and organizational feasibility).
West	2004	E-Government and the transformation of service delivery and citizen attitudes	Distinguish 4 stages of e-Government based on website content analysis
Gartner Group (Baum and Di Maio)	2000	Gartner four phases of e-Government model	Present 4 stages of e-Government model
Hiller and Belanger	2001	Privacy strategies for electronic government	Deliver 5 stages of e-Government model based on integrated perspective primarily in technological perspective
E-Government Stage Model of Indonesia	2003	Panduan Penyusunan Rencana Induk Pengembangan e-Government Lembaga.	Provide 4 stages of e-Government model based on G2G,G2C and G2B perspective.
Alijerban and Sahafi	2010	M-Government maturity model with technological approach	Provide 6 stages of m-Government model based on general perspective with technological feasibility.
Fasanghari and Samimi	2009	A novel framework for M-Government Implementation	Present 5 phases or 6 stages of m-Government model based on the general perspective (technology, infrastructure, security)
Sandy and McMillan	2005	A Success Factors Model For M-Government	Present 5 level of maturity model based on service functionality

Table 1: literature review on government stage model

4.2.2 Comparing the stages

As presented in Table 2, detailed semantic comparison of the stage model is made against each other. As a comparison, eight specific stages are identified together with the concepts and metaphors.

Authors	Number of Stages	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7	Stage 8
		1	**2**		**3**	**4**			**5**
Delloite	6	Information publishing	Official two-way transaction		Multipurpose portal	Portal personalization	Clustering of common service	Full integration	
UN	5	Emerging	Enhanced	Interactive	Transaction	Fully integrated			
Layne and Lee	4	Cataloguing			Transaction	Vertical Integration	Horizontal integration		
West	4	Billboard stage	Partial-service-delivery			Portal stage			Interactive democracy
Gartner	4	Web Presence	Interaction		Transaction		Transformation		
Hiller and Belanger	5	Information dissemination	Two-way communication		Transaction	Integration			Political participation
e-Government of Indonesia	4	Preparation	Maturation		Consolidation	Utilization			
Alijerban and Sahafi	6	Presence& disseminating information	Interaction		Transaction	Vertical & Horizontal Integration		Portal & Personalization	Electronic participation
Fasanghari and Samimi	6	E-Government /initial	Migration	Primary Interaction	Fully interaction	Transaction			Ubiquity
Sandy and McMillan	5	Initial	Enhanced	Interactive	Transactional	Fully-interactive			

Table 2: Comparison of Stages Models

1. Stage 1

As can be seen, in stage 1, all ten proposed models have the same underlying concept, which is basic information publishing in the website. This stage is an initial stage and is a prerequisite for going to the next stage.

2. Stage 2 and stage 3

The second stage refers to the interaction stages. It provides two-way communication between the government and the users. As can be seen, some models placed interaction or two-way communication in the second stage after information publishing (stage 1), but 3 out of 10 models placed another stage

before going to the interactive stage, which is enhanced and migration stage. That is why the interactive stages are put together - a combination of stages 2 and stage 3 in the cell boundaries. This means the two different stages proposed by other authors, is within the same scope with the interaction stage.

3. Stage 4

In this stage, 8 out of 10 models placed their stages as a transaction stage, while Fasanghari and Samimi's model placed fully interaction stages before transactional stages, which is quite different from other stage models. On the other hand, Delloite put the multi-purpose portal in this stage. Overall, Delloite did not specifically explain financial transactional processes in their model as others did.

4. Stage 5, 6 and 7

Details of the stage 5, 6 and 7 are primarily related to one another into the integration stage. This stage is an important development model that comes after the transaction stage. Two of the authors, Delloite and West, used portal personalization for naming this stage, which implies an integration stage. Their description of the stages is reference to the same services: one-stop services by integrating all the service between different levels and different structures of government to be clustered along common lines.

Some of the author, divided the integration stages into two stages - vertical and horizontal. Vertical integration will take place first before the horizontal integration. Vertical integration refers to the integration between different levels of government with different services within the similar function. Horizontal integration is an intra-governmental integration which integrate different levels and across different functions of government. Various functions of separate systems and different functional areas will communicate with each other and share information to provide citizens a one-stop services.

5. Stages 8

The last stage of the development models is described as an e-democracy or e-participation stage. Four authors define this stage as the last stage of e-Government developmental stages model. West and Hiller and Belanger defines online voting, polling and opinion surveys as one of the tools to improve political participations and citizens involvement. Not just high-level security and high technology, but transparency is one of the requirements to achieve this level.

4.2.3 Translating the studies - identifying underlying concepts

The next step of the qualitative meta-synthesis is to translate the studies into one another. Table 3 presents the underlying concepts and themes provided in each stage of the ten models. Tick marks in each cell represent the existence of the concepts in the model.

Metaphors	Presenting	Enhancing	Reforming	Enrichment		e-Governance	
Themes	Technology, services, citizens, organization						
Stages	Information	Interaction	Transaction	Integration	Transformation	Participation	Involvement
Delloite	X		X	X	X		
UN	X	X	X	X			
Layne and Lee	X		X	X			
West	X	X			X	X	X
Gartner	X	X	X		X	X	
Hiller and Belanger	X	X	X	X			X
e-Government of Indonesia	X	X	X	X	X		
Alijerban and Sahafi	X	X	X	X	X	X	X
Fasanghari and Samimi	X	X	X	X		X	
Sandy and McMillan	X		X				

Table 3: Underlying concepts of e-Government models to identify main stages

4.2.4 Synthesizing translation

In this step, all the underlying metaphors are explored. This step is used to confirm the finding of previous step. Based on in-depth literature review and compare all the models, five metaphors were identified to represent the seven concepts of the model.

1. Presenting metaphors

The presenting metaphors refer to the information publishing stage, which includes the establishment of the website to provide static and basic information, catalogues and published documents.

2. Enhancing metaphor

The enhancing metaphor refers to interaction concepts, which are incorporating the processes and the services in the real world situations. Interaction from the citizen perspective is meant to integrate the services and technology.

3. Reforming metaphor

Reforming metaphor correspond to the transaction stages in the model. The business process and services are engaged to provide new initiatives of transaction process. The reformation is appropriately managed to increase the efficiency of e-Government performances.

4. Enrichment metaphor

The Enrichment metaphor consists of integration and transformation stage. In this stage, the forms of the processes were transformed into more sophisticated services and technology and could be a completely different process. For example, the task of the government officers are transformed into service-oriented tasks and IT-based technologies with the automated process, so that the government can be focused on developing new services to fulfill citizen's needs.

5. E-Governance

E-governance metaphor is refers to the integration and governance of the whole process. Participation and involvement from the citizens appeared. In this stage, citizens would be able to be more involved in change process, participate in real-time decision-making. In this stage, all the citizen's involvement processes are facilitate with advanced and sophisticated technologies and transparency procedures.

Stages / Concepts	Metaphors	Description
Information	Presenting	Publishing information in the website
Interaction	Enhancing / Maturation	Enhance the services in the information process. Provide two-way communication between citizens and government.
Transaction	Reform	Reform the process and services, enable user to complete transaction process
Integration Transformation	Enrichment	Change the form of the process more sophisticated to reach the effectiveness. Enable user to customize according to their need and seek to gather integration services.
Participation Involvement	e-Governance	Processes and services are manages sophisticatedly. Citizens involve in the change process.

Table 4: Synthesizing of translation

4.3 Model's stages

As described in previous section, after compare, translate and synthesize different studies based on meta-ethnography methodology, five stages model were identified and shown below:

Stages	Description
1	Initial phase – Information publishing
2	Enhanced phase – Interaction
3	Reforming phase – Transaction
4	Enrichment phase – Fully integration
5	Governance phase – transformation and participation

Table 5 : Initial stages in SMM m-Gov

Furthermore, by including the time and complexity as an indicators, the first proposed framework of m-Government in the growth stage, illustrated in the figure 1.

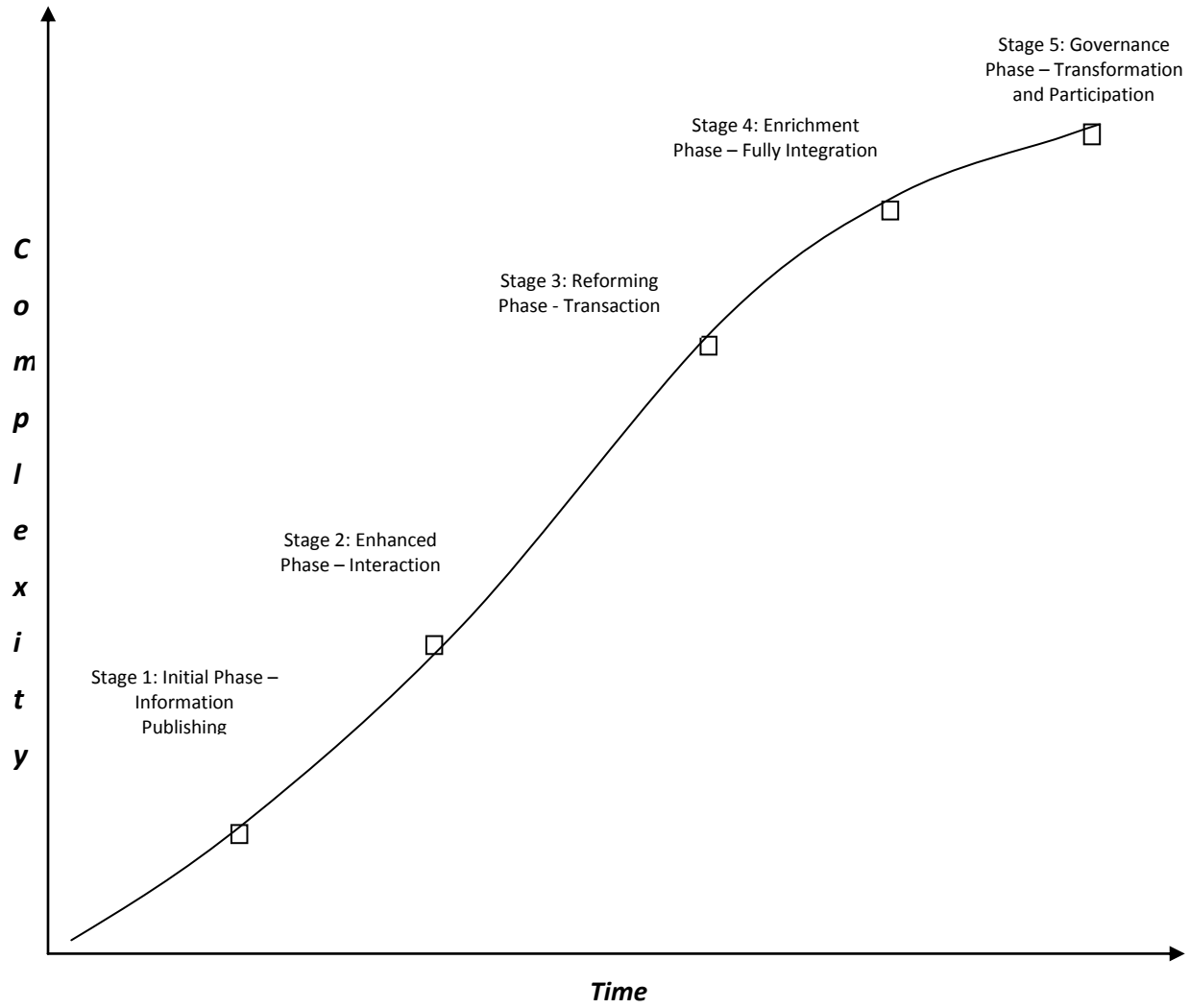

Figure 5: Initial framework of m-Government

Based on figure above, it can be seen, the governments need more efforts and time to going to the next various stages. The longest time needed to implement the stages model is position in stage 2 going to stage 3. In this transition phase, many aspects need to be considers as a priority, such as the infrastructure, security and the privacy. Before going to transaction phase, citizens should trust the government to do their transaction online. In the other hand, the government should ensure that they made a reliable, testable and secure mobile application. Furthermore, it also considers being extensible, takes into consideration for future growth.

4.4 Summary

In order to develop the maturity model of m-Government, the qualitative meta-synthesis methodology is used to compare, interpret, translate and synthesize different existing maturity model. Specifically, seven steps of meta-ethnography is used to synthesize the stage model explain in section 4.1. The methods resulting in five incremental steps: Initial phase - Information Publishing, Enhance Phase - Interaction, Reforming Phase - Transaction, Enrichment Phase - Fully Integration, and Governance Phase - Transformation and Participation. The stages is look similar with the model from Hiller and Belanger and Alijerban and Sahafi model that previous described in chapter three. These five incremental stages will be used in the construction of the SMM m-Gov model.

The following next chapter (Chapters 5 and 6) go on to elucidate and validate the SMM m-Gov with their respective stages and domains.

5 SMM m-Gov Domains

In Chapter 4, we have introduced the development process to build the SMM m-Gov using meta-synthesis approach. In this chapter, we will discuss the initial set of the SMM m-Gov domains which will be included in our final SMM m-Gov model. The selections of the domains are based on the literature review and validate with the experts interview.

5.1 Mobile Government Development Approach

Some of e-Government models proposed by the various author as described in Chapter 3 may not be applicable to the developing countries. There are some aspects that support the use of mobile technologies, but there are also some constraints faced by the government in delivering services to the citizens, namely infrastructure, low investment, high cost, technology, etc.

M-Government is a matter of getting IT system in public sector to operate with the mobile devices. In order to decide the requirements and aspects needed for the success of m-Government implementation, several authors did research in various assessments to develop the m-Government development framework with different approaches based on the need of the research market.

5.1.1 Indonesia's context

In Indonesia, there is a huge gap in e-Government implementation between the cities regarding the infrastructures, distance, literacy, citizens' readiness, management and organizational factors, including human resources. Moreover, as provided in chapter 2, some literature has dealt with the opportunities, challenges and features of e-Government and m-Government. The government tried to implement the success factors and opportunities that had been researched in some governmental projects. Nevertheless, there are still other factors to be defined that give stronger influences for developing better services with the limited circumstances.

For example, Bjorn and Fathul, explained some challenging aspects of the government to become successful projects [25, 45]:

1. The management factor, in this case, strong political leadership with clear vision is essential to determine the successful of e-Government implementation. In their paper, Bjorn and Fathul used one of a district in Indonesia (Sragen) as a case study area. There is a statement by the Head of District in Sragen, "*the change management is necessary to make e-Government*

implementation successful". This strong leadership and his political will, bring Sragen as one of the foremost district that implements a success e-Government projects.

2. The human factor

   Human resource is also one important factor, the lack of adequate personnel is critical to failure of the e-Government projects. Providing high quality of human resources, especially in IT area is important. Therefore, a training needs to be deliver to the government officers as a key person whom responsible to provide a good service to the citizens.

3. Infrastructure

   Only a few numbers of regions have infrastructures to support e-Government. In different region, they use separated lines for network connections and regular telephone connections. Therefore, the mobile government implementation could play an important role to Indonesia, since they used mobile technologies and possible to join with other private companies to handling the infrastructure, such as telecommunication company.

While Rose describing the challenge of implementing e-Government in Indonesian regional government [45] :

1. Financial / Investment

   There is quite little investment to finance the e-Government projects, because there is other urgent matter need to be done, such as education, poverty, healthcare, etc. The central government could help for the first implementation, but do not cover routine cost in their yearly budget for maintaining e-Government, therefore, local government should also be responsible and thinking about the budgets to develop and maintain their own local e-Government. To save the budget, other tools could be considered to help the success of e-Government implementation.

2. Skilled people

   Most of the regional governments do not have expertise to develop, operate or maintain e-Government development. Therefore, the helps from central government are needed.

3. Infrastructures

   There is lack of supporting infrastructures along the countries. Even more, Indonesia is consist of islands that make it harder to possess good infrastructure.

4. Law attention of regional government

   The political will and leadership are consider to this aspect. Only few number of regional government willing to maintain their e-Government implementation after running the first project, such as publishing the website.

In the other hand, particularly to Indonesia government, in 2003, as a follow up of Presidential Instruction no 3/2003, MCIT published several documents regarding to the national strategies to meet the common objective of Indonesia. A guideline of master plan for e-Government development and a guideline of infrastructure development for e-Government portal were published in 2003. By this year, local governments are started the first stage of e-Government stage model, the preparation phase. They established their own website to provide information and deliver a service to the citizens.

In the following year, a blue print of application system of e-Government is published in 2004 and blue print general design of e-Government in 2006. Both of these documents are aimed to provide the same understanding, integration and simultaneous action between all elements of government agencies to implement policy and strategy of e-Government in central and local government. It is also aimed as a reference of e-Government development, with the integration of all the application within G2G, G2C and G2B. While, the newest document published by MCIT is Information and Communication Technology White Paper - Indonesia 2010, providing report of the current infrastructure of ICT Indonesia, in the field of telecommunication, internet, digital television,etc, together with the plan, policy and regulation for future development, including: success indicator and ICT roadmap [46].

By developing all the policies and guidelines for the continuous improvement, several aspects are identified [39, 46-49] : security, infrastructure, service, system application, organizational factors, policy and regulation.

5.1.2 General Context

To discuss the general approach used widely in some countries, there are various research explaining the challenge and the success factor of the m-Government implementation. As reviewed in chapter three, Sandy and McMillan [40] identified the stages model with the correspondent success factor. They explained the numbers of success factor to deliver m-Government services as below:

1. Cost

   The e-Government project needs a lot of investment, meanwhile when doing m-Government, the government can investigate the possibility of joint ventures with private companies, for example with telecommunication company to provide the infrastructures.

2. Business re-engineering

   To operate m-Government project, each government require a central government authority, political will and regulations. Therefore, some changes are needed to create a standardization of m-Government services based on the development of e-Government project.

3. Education

   New standard of operational regarding to the wireless technology is used, therefore, the training are needed to improve the skills of government officer in all levels of government.

4. Acceptance

   The participation within all level of government is needed, both for internal relationship and external relationship between departments or agencies.

5. Security

   Security is one of the important matters in implementing the m-Government services. Privacy and data integrity should be secure from being theft and loss. Moreover, if the government has cooperation with private companies, they should arrange a clear and detail Service Level Agreement (SLA's).

6. Access

   The network and key infrastructure of m-Government should be accessible within all level of users in different locations. The usefulness of m-Government is to omit the distance and could be used anywhere and everywhere.

In general view, other potential aspect of m-Government implementation is proposed by Antovski and Gusev. They identified six aspect to be addressed in the m-Government project[27] :

1. Infrastructure development

   The physical infrastructure should be provided, such as technologies, equipments and network system in order to deliver the m-Government.

2. Mobile payment infrastructures

   As aforementioned, the government could possess the transaction level, if they can fulfill the entire requirements in the previous stage. In this case, mobile payments is needed when the

citizens are doing an online transaction. For example, the governments should guarantee the citizens that it would be safe to transact with the credit card over their mobile devices.

3. Privacy and security

   The general issues in the e-Government and m-Government projects are a privacy and security concerns. It is also one of the requirements in the stage maturity model to go into the next level. The government should assure the users that their privacy is protected and should overcome the vulnerability of the wireless network.

4. User friendly

   To increase the number of users, the government should provide an easy access with several alternatives. With the use of mobile tools that can be carry out anywhere is already one good point compare to the landlines devices. Moreover, another way of communication can be developed, not just texting or sending the transaction, but also experiencing the video communication. Therefore, sophisticated technology is needed in this stage.

5. Legal issues

   Another aspect to be considered is legal issues, in which for each country they had different law and regulations.

6. Compatibility and interoperability

   Some problems might arise when integrating the m-Government system into the e-Government system. Whether it would be compatible and could be interoperable one to another. The solution is by creating a standard for the systems.

Based on Garner's four stages model in Figure 6 below, they possessed four domains supported the e-Government coverage area, namely: strategy /policy, people, process and technology.

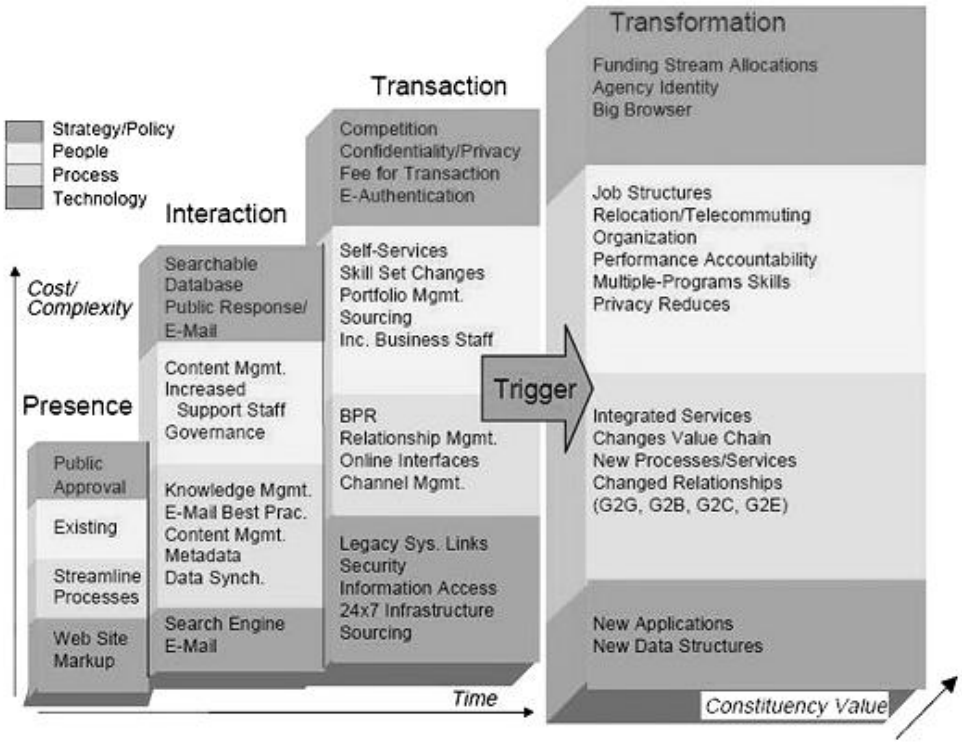

Figure 6: Gartner's four-stage model (cited from [50]

Moreover, some authors identified the approach of developing of m-Government specifically per each aspect. For example, Kumar, et al. described security issues in m-Government. In their research, security principles, security mechanism and policy implications are identified[51]. Ratnasingam[52] explained the role of knowledge management in the growth of e-Government stages. Knowledge management provides mechanism for distribution of knowledge, including the mental, behavioral, and cultural shift to improve customer satisfaction on government services. She identified the relation of each stage model to the knowledge management component. The first stage is broadcasting stage, related to the knowledge resources, interaction stage is related to stakeholders of knowledge components, transaction stage with knowledge dimensions and integration stage with knowledge characteristic.

On the other hand, Kessler, et al. [53] identified the stage of e-Government by focusing on privacy requirement. They classified three aspects of the e-Government stage model, into policy, technology, and citizen perspective. They doing a case example of developing and developed countries and comparing both of them. A proposed framework for assessing privacy readiness of e-Government is resulted.

5.2 Model's maturity aspects/domains

Based on the literature reviews from various researches related to the m-Government aspects as explained in sections 5.1 above and review on the e-Government and m-Government maturity model described in Chapter 3, the first initial of maturity domains are gathered. The domains is mostly coming from the gartner's four stage model and Sandy and Mc Millan model. From the reviewed, the SMM M-Gov possesses seven domains. All domains fit with each other and enrich SMM m-Gov's coverage. Table 9 lists SMM m-Gov's initial domains.

Domains	Description
Technology Infrastructure	This aspect of physical infrastructure contains the technical implementation of the IT components, such as network, information exchange format, equipment data standardization, tools, etc.
Security	Issues regarding to the fundamental security requirements. Government should guarantee the security of all transaction to build trust.
Application services	The services provided by government to comply with citizens satisfaction.
Policy	The clarity of policy requirements through the maturity stages.
Knowledge management	provides mechanism for distribution of knowledge, including the mental, behavioral, and cultural shift to improved customer satisfaction on government services.
Human/organizational Factors	Identified the behavior of the people in the environment for each stage.
Privacy	Addressing privacy concerns regarding to data collection.

Table 6: Initial domains in SMM m-Gov

Further explanations for each domains will be explain in chapter 6.

5.3 Validation processes

To validate the domains and stages of the m-Government maturity model, an interview with several experts are conducted. The experts come from the academia and practitioners who's having the expertise in the field of government, dealing with e-Government project and/or teaching e-Government course. In the interview, the experts were asked to review the five stages in the model whether something need to be add or remove. Furthermore, the experts were also asked about the seven

domains of the m-Government maturity model, which they considered were not in the list and should be added, or some domains need to be removed.

In the interview session, the experts express their general ideas and expertise about e-Government, m-Government, and maturity models. Constructive discussion happened during the interview. The questions are listed in Appendix A.

All interviews sessions were recorded for further analysis. For the matter of privacy, we keep the anonymity of the participants. Their input and comments are highly appreciated and small discussion was created after the interview session to share ideas and suggestion related to this project.

5.4 Validation results

From the experts' interview, we identified some key points that come out as a results of the interview session:

- All the interviewees agree with the five stages of the maturity model, which comes up from the meta-synthesis approach. They agreed that the stages model is similar between e Government and m-Government, because m-Government itself is a part of e-Government, the main difference is the diffusion of technology, the tools being used (which is mobile technology) and the time efficiency, because it can be access anytime and anywhere and available 24/7.
- One of the interviewees is mostly dealing with the government project, within or outside the Netherland. He argued that m-Government could not easily implemented in the developing countries, since to go to the third stages of the maturity level, they need higher tools such as smart phone, PDA, tablet PC or even notebook, in which small number of people used it in developing countries. It means, the effort and time consumptions will be mostly the same with the development of the e-Government itself. He also argued that m-Government would work well as a reminder for the citizens to go through the next steps. For examples, if user needs to renew their passport or paying the taxes, if they do not have tools like smart phones or higher mobile technology, they can receive an SMSs alerts regarding to their needs so that they can go to fill the application in the desktop with wired internet or go to the internet kiosk, etc.
- While other interviewees argued that the m-Government implementation is working well in developing countries, as they know that in some countries in Africa skipped some e-Government stages to go through the mobile government implementation with the wireless infrastructures. Those countries, developed their wireless infrastructure better than the wired infrastructure.

The citizens are also feel comfortable and secure to use their mobile tools to access the government services.

- The experts agreed, M-Government works well in the way of giving a reminder to the citizens. Such as earthquake alert, renewal license alert, elections alert, programs and agenda alerts, etc.
- All the experts mostly agreed with the seven domains in the list, but they added some aspects such as :

  For the technological infrastructure: They agreed it would be one domains, since the infrastructure is related to the technology itself. It also includes the network, devices, equipments and infrastructures.

  For the organizational factors, they gave comments about the digital skills and support of the top level, the implementation will be hard to develop without good leadership and good will from the top management.
- All the experts suggested to add the domain: 'user'. We had some discussion with the experts with the terms of 'user", because it could be classified into a different view: the participating user, user perspective and user needs or usage. Some experts were referring to the terms of 'user needs'. This terms is obtain based on past experienced in government projects, when they conducted a brainstorming of the e-Government experts, they classified 4 categories of the government implementation:
  1. IT (which is also include technology and infrastructure),
  2. Strategy and policy (including the vision, mission, regulation, law, etc),
  3. Organizational factor, in which how to organize the processes
  4. User needs and behavior, the government should know what is the need and usage of the citizens, so that they would be convenient to use the new system.
- One of the experts suggest to distinguish the framework based on the back end and front end processes. The back end itself is more to how to improve the process and use the ICTs to streamline the business processes. While the front end, is more to the usefulness of technology, in the case of m-Government, is about the devices, designing the website, applications, etc.
- Some of the experts are talking about multi channeling. The communication between government and citizens is not only about e-services with the use of internet, but also including face to face communication, telephone calls, sending the printed form by post, and also using mobile phone, whether by texting a messages or using the internet connection.

By all the recommendations and interview results, we consider the user needs to be added in the domains of the construction of SMM m-Gov. Other recommendations are used as the complement to this thesis.

5.5 Summary

Seven initial domains of SMM m-Gov are derived from the in-depth literature review: Technology infrastructure, security, application services, policy, knowledge management, organizational factors, and privacy that could be classified into technical and organizational factors.

From the construction of stages and domains as a part of stage maturity model of m-Government, the first validation part is conducted to check the initial model with the potential to use in real life context. From the results of the experts' interview and empirical evidences, one domain is added to the model, namely user needs.

Together with some adjustment to the model, eight domains of maturity models together with five incremental stages and the content of each dimension were designed and will be further explained in chapter 6.

6 Stage Maturity Model of Mobile Government (SMM m-Gov)

In this chapter, the SMM m-Gov model is presented together with an explanation for each stage and each of its respective domains. This is followed by the maturity assessment tools that can be used to help government and their agencies identify at what stage they are, and to develop a specific organizational roadmap and improvement plan based on their current condition. By using this assessment tool, a government can quickly and easily assess their current stage and create their own desired maturity stage that they would like to be in the near, medium and long-term future. Essentially, they can create their own targets within an achievable realistic timeframe.

6.1 SMM m-Gov initial Model

The stage maturity model of m-Government is designed to portray the development of mobile government implementation with its five incremental stages. Each stage consists of eight domains. Each domain reflects what the m-Government implementation should look like in each stage. It provides a framework to measure the maturity level of the government's capabilities and how to effectively engage all the stakeholders to perform their respective services.

As explained in the previous chapter, m-Government works as a supplement of e-Government model. Governments interact with citizens through different channels. From traditional way, like face to face meeting or standing in a queue to the electronic channel such as internet. One of the electronic channels is through mobile devices such as mobile phones and tablets. These improve and enhance the ways of communicating and interacting between government and citizens. By not being limited to the use of personal computer (PC) and wired connection, using mobile devices with wireless connection greatly enhanced and speeded up the communication process. M-Government is used as one of the strategies to accelerate the delivery of government services with its advantage of mobility and wireless connection. Whilst the e-Government process is more to the 'back-end' processes, is about improving the process in the back office, streamlining the business process as well as how wireless access can be used in ICT, in general, to improve the interaction and relationship between government and citizens.

In this chapter, we present a new model, consist of five incremental stages and eight domains. These can be used as key tools that can lead to measurable improvements in the government interactions with its citizens. These actions can be recognized by utilizing the maturity assessment tools. This model is considered as the first mobile government maturity model with its two dimensions, stages and domains. The stage maturity model is depicted in the matrix model, and illustrates a range of features from Initial

Phase – Information Publishing in stage 1 to Governance Phase - Transformation and Participation in stage 5. Its design takes into account the linkages between the previous e-Government models and supplement with the new m-Government model at each level or stage, as well as, in each domain. This combined model brings stages/levels and domains, together into a completed framework.

The initial SMM m-Gov model with its stages and domains are shown in Figure 7. The stages are shown in the horizontal axis and the domains are shown in the vertical axis. Further detailed of each cells shown in the end of this chapter, see Figure 8.

Stage / Domain	Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Technology					
Infrastructure					
Security					
Application					
Services					
Policy					
Knowledge Management					
Human and Organizational Factor					
Privacy					
User need					

Figure 7: Stage Maturity Model with its Stages and Domains

6.2 Maturity Stages of SMM m-Gov

The five stages presented in the model are derived from meta-synthesis approach we explain in chapter 4 that come from various e-Government and m-Government models. Below is the explanation of each of the stage.

6.2.1 Stage 1: Initial Phase – Information Publishing

Stage 1, Initial Phase, is the very basic level of the maturity. Governments, at this stage, may have considered the use of publishing their information on their websites so that the information can be downloaded and/or accessed by mobile phones. This means, the government website should be accessed via mobile tools and their respective programs. The website should be designed to accommodate relatively small file sized data fields that are usable for mobile phones. Basic information with basic web technology and basic application services were provided, such as: bulletin board, catalogue presentation, FAQ,. The information about the government is available to fulfill the needs of user. In this stage, online activities track and access tracking is available. The citizens can easily use simple mobile phone to access the websites with 2G, GPRS or 3G network.

6.2.2 Stage 2: Enhance Phase – Interaction

In this stage, two-way communication starts to occur between citizen and government. This second stage enables citizens to interact widely through mobile phones and other similar devices. Citizens or users of the government services can download forms, use search engines to find information, provide comments, and correspond with government officers through chat rooms, SMSs or e-mail. The login information with the password authentication and location based services also could be provided.

This is an important stage for the development model, because the most likely m-services initial development in the majority of countries is SMS based services. For example, m-transportation in Greece: the drivers receive SMS notifications about the estimated total transport time for a particular delivery, while in Philippines text messaging is used to report any criminal activity and their wrongdoings by police officers [54]. Moreover, the fast development of m-services are reported in Africa. Based on Sida report [55], in many African countries such as Kenya, Tanzania, Rwanda and Uganda, SMSs services are used in various sectors such as agriculture, health, financial, education, etc. In these listed African countries, SMS services and SMSs notifications are used extensively to reach all the citizens, especially those in rural areas.

6.2.3 Stage 3: Reforming Phase – Transaction

The third stage incorporates a transactional capability and requires more advanced security capability at the mobile devices and the technologies. To move from stage 2 to the stage 3, the government needs more effort and time, because security and its verification is the greatest concern in this stage. This stage requires systems or applications capable of performing secure transaction. Small transaction can be done with the use of simple application or simple mobile phone. Citizens can initiate financial transaction with a simple SMSs services, for example, paying their utility bills and other services. Based on research, there are many examples in some countries on how they use mobile government to carry out financial transactions. For instance, mobile parking fee payment in Sweden that allows citizens to pay the parking fee with their mobile devices. M-local tax management system in Korea, which allow officer to access information and transfer particular data to the local database [56].

Furthermore, citizens are able to engage in complex financial transactions, such as paying tiered fines, paying taxes and paying administrative services with secure financial transaction. In these cases, the mobile device or phones that are used needs to be very much more intelligent device such as smart phone, PDA or Tablet PC.

In transaction stage, we can illustrate the collaboration between e-Government and m-Government in the same curve as depicted in Figure 9. This is because most core activities are supported by a set of standardized process, infrastructure and methods. Here, the citizens are able to engage in financial transaction with their mobile devices or they can go through with the desk computer if their mobile device does not support the applications. Moreover, in this stage, global positioning services (GPS) could also be introduces.

6.2.4 Stage 4: Enrichment Phase - Fully Integration

As portrayed in Figure 9, m-Government and e-Government models have a great synergy and, from a user perspective, are able to work together. In this level, an online service of governments is provided across institutions vertically and horizontally. In stage 4, government agencies are able to communicate with each other. Citizens are able to access all available governmental services through a single portal or an internet access point. Portal personalization is also present, this means that government agencies can utilize and create a single window, which is highly personalized and specific to that government. Citizens and other users accessing that portal can carry out financial transactions and communicate between different government agencies. Therefore, intelligent mobile devices such as, PDA, smart phone, tablet PC and net books are needed because simple mobile phones do not have the security or system

capability which is required at this stage. The government has an access control and data access rights management to the privacy and security features that are incorporated into their portal site. In other words, in this stage, government sets minimum access and security standards for transactions to and from all of its agencies when those agencies are accessed via the government portal, not only the processes are effectively controlled by the government, but also standardized tools and processes across all other government institutions and departments.

6.2.5 Stage 5: Governance Phase – Transformation and Participation

Stage 5 is the last and the highest level of this model. Currently, there is no country that has completely reached this stage. To get into this stage, the government requires very good infrastructure and coordination between all agencies and stakeholders. At this stage, all government departments need to share common processes and have a common understanding of how to present their own information. For G2C, G2G, and G2B transactions and services, this common understanding is very high.

Transparency, accountability and electronic democracy need to be fulfills in this stage. Integration between all government departments and the ability for a user to participate in various social and political activities through websites is paramount. Government can effectively achieve this last stage by continuous improvement efforts.

6.3 Maturity Domains of SMM m-Gov

Based on initial domains of the model described in sections 5.2 and reviewing the model with the experts, some revision and addition of new domain are added to the model. From the result of experts interview, a new domain was added to the SMM m-Gov model, entitled 'user needs'. For example, in the business perspectives, before developing a new model or product, the research and development division will conduct research or surveys to find out the needs of the user. The research result will try to align the government business goals and the user needs. Likewise, for government, to deliver the most effective and efficient services to the citizens, they should know what the needs of their users are and how they may change over time.

Each of the domains listed on the left hand side (Figure 7) can be divided into several sub domains. These can then become key indicators which can be used as an assessment tool to conduct case studies such as the case studies for Indonesia (See Chapter 7). The full model of the SMM m-Gov is depicted in Figure 8. Each of the domains are reviewed and explained below.

6.3.1 Technology Infrastructure

This domain describes all the aspects related to the technology and infrastructures, such as network, information exchange format, tools, equipment, data standarizations, etc. These key aspects of infrastructure need to exist in order to provide mobile wireless connections to all constituents. The technology should fulfill these demands and enable various potential applications access. Government has also a role to strengthen and standardize the telecommunication and network infrastructure, since m-Government uses mobile equipments and wireless network infrastructures as a tool.

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Disjointed - Manual Infrastructure	Coordinated – Manual infrastructure	Standardized Infrasructure	Consolidated Infrastructure	Fully consolidated - Government and stakeholders works in partnership

This domain is subdivided into five key indicators: This domain is subdivided into 5 key indicators: quality of the website, type of network, type of mobile devices, data standardization, tools and communication format.

6.3.2 Security

The security domain describes the fundamental security requirements for each of the five stages. The government must confirm the user identities and create policies for controlling access of the various user activities. Furthermore, wireless networks are vulnerable to be attack, hack or steal important government information because it is using public airwaves to send and receive the signal [27]. It is essential for the government to develop high security mechanism so that users will have trust when carrying out financial transactions over the mobile phone, such as send their credit card information.

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Online activities track	Authentication	Confidentiality	Access control	Highly secure and accountable

This domain is subdivided into 3 key indicators: messaging security, wireless network security and the mobile device security mechanism.

6.3.3 Application Services

This domain describes the application services provided by the government to fulfill satisfaction of the citizens. Technology has advanced so rapidly that the applications are becoming more simple and able to respond the needs of the citizens and able to improve the productivity and quality of the government services and its administration. Government should deliver services through various channels depending on the user requirements. Government could develop simple mobile device applications, to simplify user access and allow better integration between back office processes and front-end processes.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Basic application services	Basic application services with interactive session	Advanced application management	Scale optimization	Application Orchestration

This domain is subdivided into 3 key indicators: complexity of the application services, scope of application services and application services governance.

6.3.4 Policy

This aspect considers the strategies and policy requirements so as to anticipate potential change of user demands and to allow an increased involvement of its citizens [57]. This policy domain has to deal with the clarity of the policy. It concerns on how to regulate the data collection and how the data is collects. The government responsible to protect the data of the user: how the data is being used and to stipulate and how to obtain full control of the information to ensure the information is used for the purposes it is meant for.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Policy on information / data collection	Policy on information use	Policy on data protection	Policy on information sharing	Policy on individual participation

This domain is subdivided into two key indicators: policy information, and Service Level Agreement (SLAs).

6.3.5 Knowledge Management

In general, knowledge management is a mechanism of acquiring and organizing a continuous learning and knowledge sharing so that others may use the knowledge that is built on what is already known by the organization [58, 59].

In this domain, knowledge management is about the distribution of knowledge, including the mental, behavioral and cultural shift to improve customer satisfaction of government services. It elucidates the procedures to access, use, share and update the knowledge related to the government and how the government can use IT to support knowledge management. Based on Wagner et al [59] , the role of knowledge management is classified into three areas: relationship to the citizens, the interactions between citizens and government and the ability to respond to the citizen's demand. Relations within government departments improve the efficiency of the back office operational processes between government departments by reusing the knowledge and experience when the various departments are collaborating with each other.

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Knowedge Resources	Stakeholders of knowledge management	Knowledge dimensions.	Knowledge Characteristic	Knowledge creation

This domain is subdivided into three key indicators: government vision, digital skills and government expertise. The subdomain digital skills is obtained based on experts input, since one of their research is about digital skills in the society [60].

6.3.6 Human and Organizational Factor

The organizational aspect is identified as the behavior of the people in the environment, includes leadership, investment made by the government, political support, user participation, organizational climate and awareness of the government project. The lack of the top management support and lack of adequate personnel is a critical to the successful or failure of all e-Government projects. Providing high quality of human resources, especially in IT area, is an important feature in this domain.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Creating awareness	Creating trust	Creating choices (of transaction)	Consultation	Controlling

This aspect is subdivided into four key indicators: commitment from management, level of funding, user participation and government awareness.

6.3.7 Privacy

This privacy domain addresses privacy concerns related to data collection. The government must ensure that citizen's privacy is protected and the information will not be shared with any third party or unauthorized parties. Based on the research, citizen's trust is in a government organization could reduce perception of the risk involved in the disclosure of personal data for e-government services [61] . The government should ensure the safety of personal data that collected from the citizens.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Surreptitious	Voluntary data	Personally sensitive data	Aggregation on information	Civil right and constitusional

This aspect is subdivided into two key indicators: data protection and information collection.

6.3.8 User needs

The user needs domain is measured how well the solution matches to the need of the user. All governments need to meet the needs of their users and, at the same time, meet and satisfy the government goals. Government needs to understand what challenges to be addressed to deliver the maximum quality of service to the citizens and to clearly know what user needs and what users want.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Availibility of information	Accessibility of services	Usability of services	Personalizations	Control of information

This aspect is subdivided into two key indicators: Target groups and user readiness.

6.4 Stage Maturity Model of m-Government (SMM m-Gov)

As we explained before, the completed model of SMM m-Gov is shown below in Figure 8 with the matrix model. The stages ranging from initial to full development are shown on the horizontal axis and the domains of the maturity shown in vertical axis.

The five stages are based on analysis of the different e-Government and m-Government models using qualitative meta-synthesis methodology explained in chapter 4. Whilst the domains were based on the review of various literature review and mostly came from two models that previously explained in Chapter 6, which is Gartners's four stages model and Sandy and McMillan model. The expert interviews are conducted to judge the importance of each domain in an initial list and the experts also asked if there are other domains, in which they considered missing in the list and should be added or if some domains should be removed.

Furthermore, the eight domains are subdivided in total of 24 key indicators to be used for the maturity assessment tools for the case studies.

Stage / Domain	Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Technology Infrastructure	Disjointed - Manual Infrastructure	Coordinated Infrastructure	Standardized Infrasructure	Consolidated Infrastructure	Fully consolidated
Security	Online activities track	Authentication	Confidentiality	Access control	Highly secure and accountable
Application Services	Basic application services	Basic application services with interactive session	Advanced application management	Scale optimization	Application Orchestration
Policy	Policy on information / data collection	Policy on information use	Policy on data protection	Policy on information sharing	Policy on individual participation
Knowledge Management	Knowedge Resources	Stakeholders of knowledge management	Knowledge dimensions	Knowledge characteristic	Knowledge creation
Human and Organizational Factor	Creating awareness	Creating trust	Creating choices (of transaction)	Consultation	Controlling
Privacy	Surreptitious data	Voluntary data	Personally sensitive data	Aggregation on information	Civil right and constitusional
User needs	Availibility of information	Accessibility of services	Usability of services	Personalizations	Control of information

Figure 8: Stage Maturity Model of m-Government

6.5 Framework of e-Government and m-Government Development

Figure 8 below, depicts the development of e-Government and m-Government stages. The figure shows how the two models can be synchronized to enhance each other.

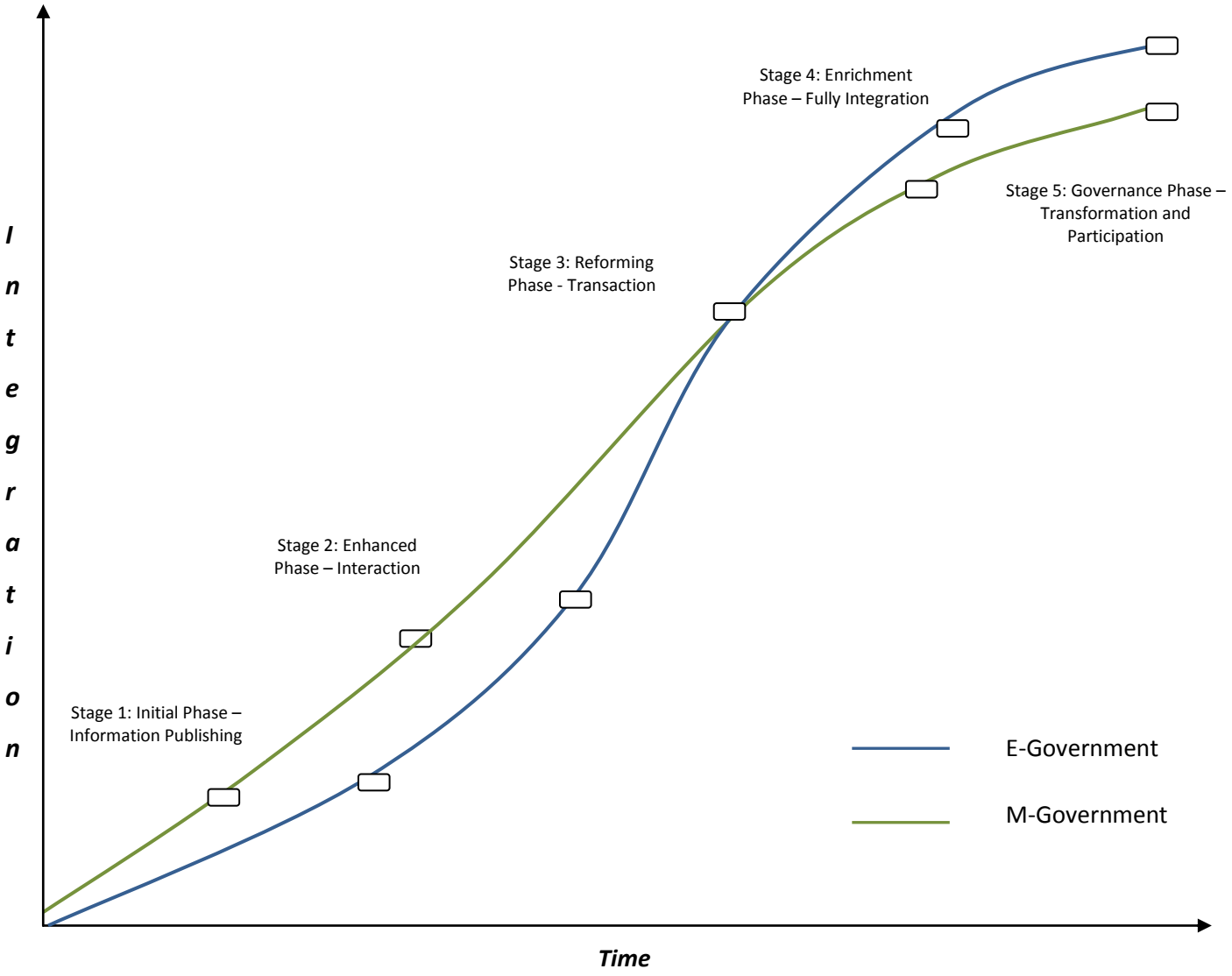

Figure 9: Framework of e-government and m-Government development

From the initial m-Government framework, depicted in Figure 5 in Chapter 4, along with the m-Government framework discussed in this chapter, we can see that, by bringing these two models together, a new framework can be developed which allows m-Government to strongly complement e-Government capability. In this figure, we can see that in the first two stages, m-Government could be

developed much faster than e-Government services . M-Government is useful to reach citizens which previously could not access any or very few government services conveniently, so that citizens can get immediate access to certain government information anywhere and anytime basis. It also helps to accelerate the online literacy of the citizens to use the government services, overcome the lack of wired internet connectivity limitations and prevail over digital divided issues of e-Government.

In stage three the citizens are already aware and know about the online services delivered by the government. To go to the next stage more quickly and to be able to deliver more complex services and information, m-Government and e-Government models can be brought together to provide information and services to the citizens in a more timely and complete manner.

PART III: EMPIRICAL RESULTS

7 Case Studies

This chapter outlines the analysis of two case studies in m-Government development in Indonesia. First is a central government regulatory body called Ministry of Communication and Information (MCIT) and the second is the local government bodies, the district of Sragen in Central Java.

7.1 Case Studies Method

Multiple case studies were conducted to assess at what stage of the m-Government maturity level of the central and local government in Indonesia. One study came from the central government body, MCIT. MCIT delivers government services as well as delivers policies and regulations. The other one is from local government, which has already implemented m-Government programs, the district of Sragen in Central Java.

The use of these two (multiple) case studies is an appropriate research method to test the constructed maturity model for different type of government in different areas: rural and urban areas [62]. The studies will help reveal if, whether, there are any differences between central and local government, for instance: the willingness to use it and, if there are enough capable human resources to develop and maintain the program, etc.

These two organizations were used as samples based on their experiences regarding the development of m-Government. Based on MCIT's data, Indonesia has around 497 local governments or main districts spread over 33 provinces with around 34 ministries. From those numbers, only 214 local governments have websites as the first phase of e-Government development. From those 214 sites, 186 are accessible to the public and from those numbers, only 10 percents of the local government has started implemented m-Government.

After selecting the organizations, the maturity assessment tools consist of 24 questions sent to the officials in each organization. A semi-structured interview is conducted to the officials that have leading roles in the m-Government development program in their particular government organization.

The data collected to these questionnaires were used to determine the level of maturity in each department in the current time and environment. The majority of the respondent possessed an experience in e-Government program and/or acted as a head of IT division related to e-Government.

7.2 Maturity Assessment Tools

To match the solution to the problem, the governments need to meet the needs of the users and the government goals. Governments are required to discover what challenges to be address do deliver the maximum service to the citizens.

To assess the maturity of the m-Government development in government agencies, we conducted the maturity assessment tools that consist of interviews and questionnaire, constructed based on the five stages and eight domains of the maturity model.

The maturity assessment tool is structured as following [63]:

- Interview questions about the SMM m-Gov
- Conduct the questionnaire
- Introduction to the questionnaire that explains the development process of the SMM m-Gov
- General questions about the organizations and the respondent
- Multiple choice questions corresponding to the key indicators in the maturity model. The questions are grouped according to the 8 domains in the SMM m-Gov. Each of the answer have been described that match to the each stage.
- Additional comments regarding to the questionnaire.

24 questions are presented to represent 24 key indicators described in previous section. For each key indicators, 5 scenario's have been described that match for each of the stages. The respondent is asked about the best scenario that fits the condition in the organization. There is an option of 'no opinion' If the respondent does not know the answer of the questions or not willing to answer. There is also an 'additional comment' to accommodate the input or feedback from the respondent.

For example, question 1 is given as below:

1. How would you describe the quality of the website in your organization?
   a. The website provides basic web technologies, published information and government publications.
   b. The website provides downloadable forms, email and search engine features.
   c. The website provides government application services, supporting online financial transaction services.
   d. The website provides universal services across multiple department (one-stop portal), users can customize the portal. System is integrated across different functions.
   e. The website provides sophisticated, unified and personalized services to the user regarding their own need and preferences. User can participate in political participation.
   f. No opinion.

   Additional comment:

From the question above, we can see the options a until e, representing the stages from stage 1 to stage 5. The questionnaire sent to the respondent in Indonesia as case studies. The full set of questions can be found in Appendix C.

7.3 Ministry of Communication and Information Technology

7.3.1 E-Government Program

As aforementioned, e-Government in Indonesia was officially brought to the public by the PI no. 6/2001 on telematics on the 24th April 2001. To implement e-Government widely to all parts of the nation the Government of Indonesia assigned the Ministry of Communication and Information Technology (MCIT) to manage the creation and implementation of e-Government. MCIT has been developing e-Government both at the national and regional level by helping local government to establish their own e-Government through socialization, training, workshops, seminars, etc.

MCIT was formed with the following objectives [8, 64]:

1. To develop good services to improve the quality of information and communication network by building integrated public services, develop standardization, creating electronic data management system, etc;
2. To develop the management system of central and local government, with the focus on improving the quality of services needed by the citizens and managing the regulations;
3. To optimize the use of ICT with the focus on interoperability, standardization and procedure within and inter-government network;
4. To improve participation of private sectors on ICT business. The focus is to encourage the participation of private sectors and to use the expertise of business sectors.
5. To develop human resources capacity in the central and local government. Focusing on capacity building of the manpower, by developing ICT culture in government institutions, optimizations on ICT training facilities, giving a training, and workshops to the local government.

Moreover, as a regulatory body, MCIT established standardized process for all local government, written in the handbook of e-Government, published in March 2003. Other standardizing publications introduced several improvements such as: guidelines of government web portal infrastructures in 2003, Blueprint of application system in 2004, Blueprint of e-Government in 2006 and the latest is Indonesia ICT whitepaper published in 2010 as a milestones and outlook of the development of information and communication technology throughout Indonesia in the last decade.

7.3.2 Results of the Maturity Assesment

The maturity assessment was given to the number of officials in MCIT, from the Echelon 4 until Echelon 2 in e-Government directorate - MCIT. The total number of respondents is eight. The respondents who were interviewed range from head of e-Government Interoperability, head of e-Government Technology, head of e-Government infrastructure, Deputy Director e-Government in IT Governance, deputy director for ICT empowerment in rural area, until the Director for eGovernment itself. The semi-structured interview was conducted with some people who filled in the questionnaire. They answered the questions based on general understanding and expertise and look at the case in the local governments that they handled.

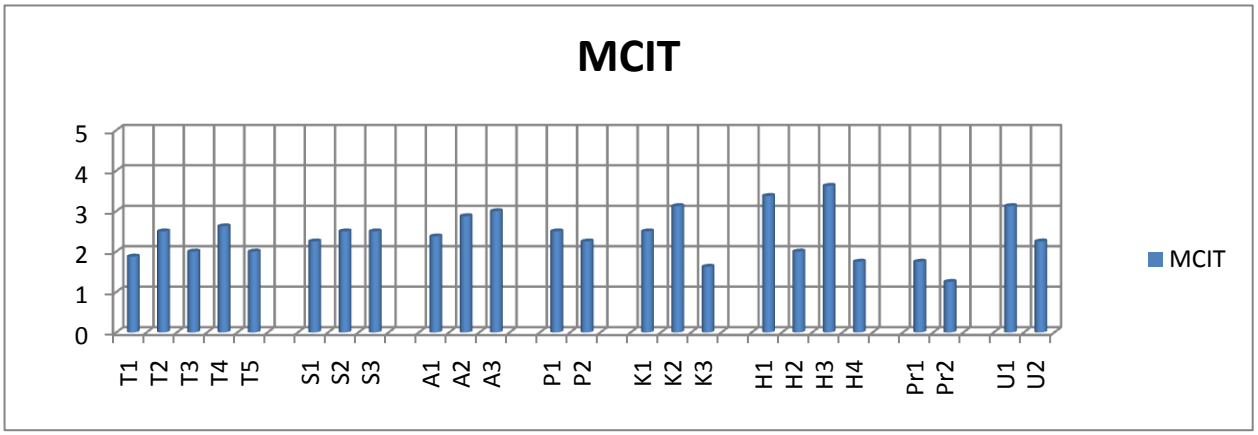

Figure 10: Result of Maturity Assessment in MCIT

As depicted above, the horizontal axis shows the questions and vertical axis represent the maturity stages for each key indicator. The key indicators are ordered according to the maturity assessment tools, which are described in Chapter 6. For example T1 means the first questions of the 'Technology Infrastructure', S3 means the third questions of the 'Security" aspect and U2 means the second questions of the 'user needs' aspects and so on. The answered are the averages of the entire answered questionnaire. The results is range from scale 0 to 5 based on the assessed maturity scale. The semi-structured interview is conducted to explained the quite extreme answered. For example, questions U1, it between stage 3 and stage 4, because the target groups for m-Government implementation are not only to the citizens, but also to the government officer and business stakeholders or private company (ranging from G2C, G2G and G2B). Also for the H3, included the actors involved in giving a services is not just the government and the citizens as the end user but also including the telecommunication provider, service provider, content provider, banking company and so on, which helps the delivery of m-Government services. When the interview is conduct, they said that business sectors, such as telecommunication provider or banking company helps the government to deliver the services within their expertise and infrastructures. For example, in one of the local government, the telecommunication provider has cooperation with them by using SMSs to integrate back office processes. The officials use the number for those provider and they can send the SMSs through all the employees while conducting a meeting or giving a disposition.

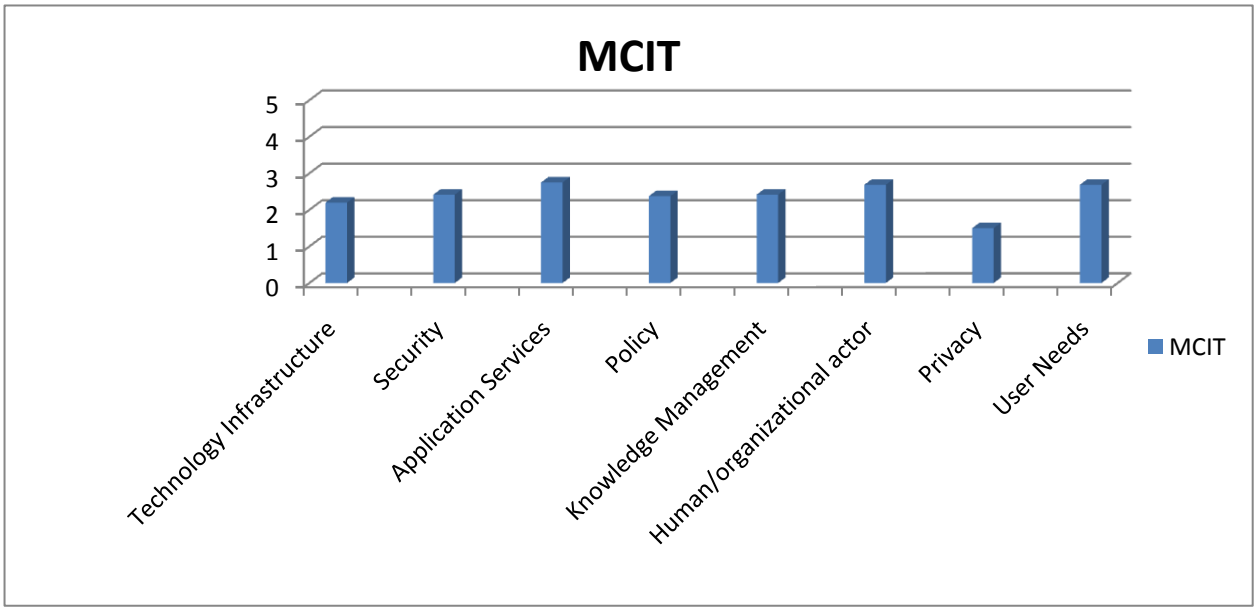

Figure 11: Maturity Stages per Domains - MCIT

As can be seen in Figure 10, the average maturity stage ranges from 1 at the privacy aspects until 3 at the user needs aspects. With the average on all maturity aspects is in level 2. The most relevant information from the interviews is discussed per aspect. Based on the result, it can be seen that privacy is on the lowest level of the maturity. Other results per each domain is provided in appendix D.

Privacy

The privacy, regarding to the data collection, should be considered when develops m-Government projects. The government should ensure that the citizen's data would not share with third parties without end user permission - especially when they had cooperated with private companies. The application procedure consists of providing personal data such as their name, birth date, address or phone number should be used for its intended purpose. Low level of privacy is occur because there is no trust from the citizens to the government. Internet users may be inclined to do things-especially transaction- online because of data sensitivity and risk perception [61].

7.4 District of Sragen

7.4.1 e-Government program

The District of Sragen located in Central Java – Indonesia is one of the most advanced e-Government implementation among the local government due to its achievement of winning Indonesian e-Government award in 2006.

Based on their vision in 2006-2011 called “Sragen Smart regency” and supported by their middle term mission to the actualization of a “harmonious Sragen”. Their vision is based on the features of self-reliance, advancement and the enforcement of legal supremacy supported by quality human resources, however only one of these features relies on the science and technology. Therefore, they try to achieve the 5 years vision and mission by enhancing e-Government development program. As can be proved in their website: www.sragenkab.go.id , Sragen has good quality of local government websites, thus, provided adequate public services and all detail information about Sragen Regency: overview, government information, regional data, infrastructure, tourism and their potential investment, agenda, news, public services and many more. They also provide bilingual websites in bahasa and English.

Moreover, Sragen is well known as the first local government, which has successfully implemented resident identity cards electronically until the level of rural areas. Citizens are able to access general information, downloading forms, and also one-stop services to several services, such as identity cards, license, building permit, and so on. They received many awards and their achievements are widely recognized. Specifically the awards were for the development of e-Government, for example: the best e-Government award in 2008, Innovative e-Government in 2007 and 2008, leadership award from 2006, the best one stop service awards and many more.

The interviews were carried out with the head of ICT office in Sragen regency having many years of experiences in the field of e-Government. The interviews focused on the participants experiences with the e-Government projects and their opinion about the development of m-Government in their regency.

7.4.2 Result of Maturity Assesment

The respondent of the questionnaire is a head of ICT office in Sragen regency of Central Java. The interview was conducted with same person. The head of ICT in Sragen is responsible for the management of the e-Government development program and managing the ICT infrastructure for the District of Sragen.

All the questionnaire questions were answered by the respondent, the result ranges from 1 until 4 as depicted in Figure 11 below.

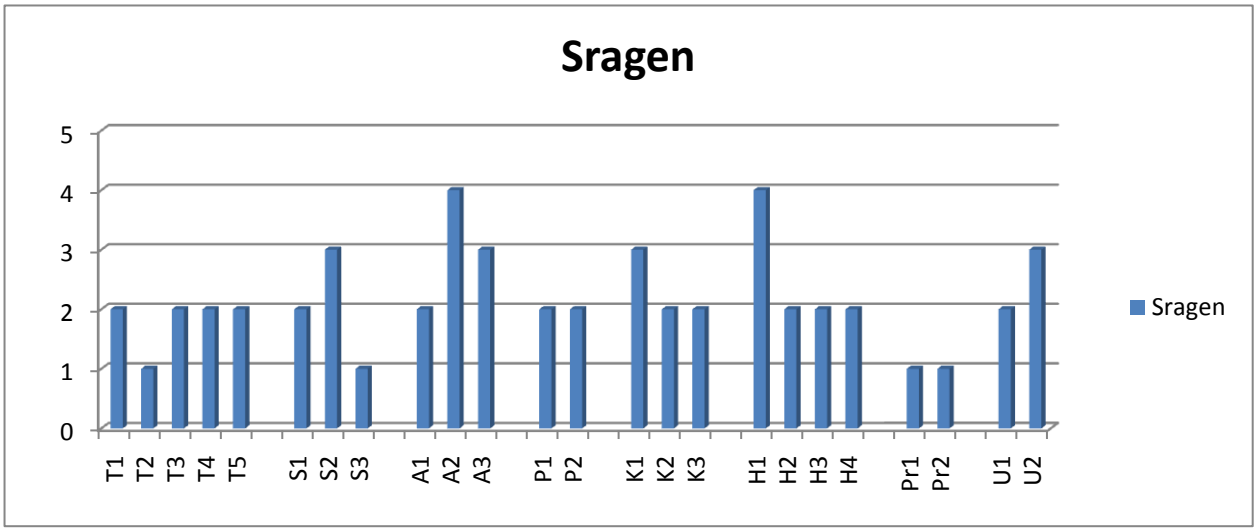

Figure 12: Result of Maturity Assesment in Sragen

The average of maturity stages per domain is depicted in Figure 12. We can see the average level is between stage one and two, and for the application services is going to stages 3. This is because district of Sragen develops many in-house applications to be internally used to accelerate their back end processes within the employees.

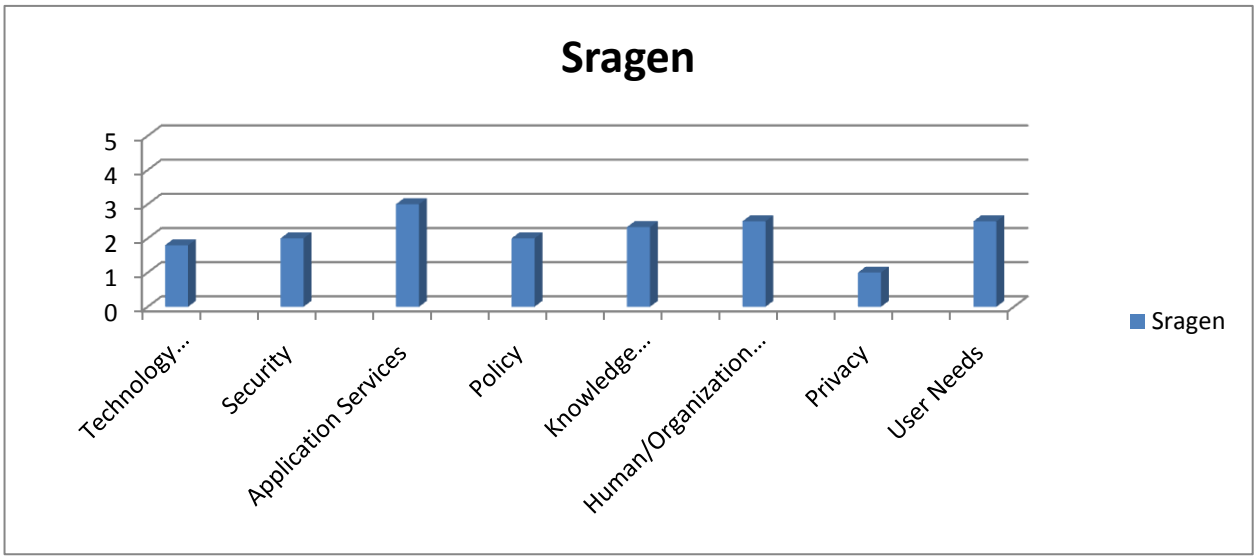

Figure 13: Maturity Stages per Domains

From the results, the application services are on the highest level of maturity and the privacy is on the lowest level of maturity. The local government also facing the same problem with the central

government in terms of privacy concerns. Further explanation of each domain, is provided in Appendix D.

Application Services

The government of the Sragen regecy, develops many in-house application throughout the organizations and were used in most agencies/department. They provide back office and front office management information system and they had standard for the applications. ICT & electronic data center agency created it and send it throughout other agencies and regional work units.

Some of the application developed by Sragen district were: Electronic office application (e-office), are used for exchange information vertically between agencies until the sub-district and small village. Other applications were: Electronic letters application, are used to correspondence between agencies and departments, electronic disposition application, personnel management information system, payroll management information system, monitoring information system, healthcare information system and many more.

On the other hand, the front-end application provided by Sragen regency were: the front office management information system that can be used to communicate with the citizens, Sragen web portal, geographic information system (with textual, graphics and spatial data), resident administration information system, permit application, e-procurement, regional market and trading information system, library information system, and many more.

Moreover, most of the application can be used in mobile devices. Based on the interviewee experiences, most of the time, he used mobile devices using e-office applications, e-letter and e-disposition application to stay connected with other employees while he was mobile in another areas, to give a direction or disposition to subordinate, and so on. SMS notifications are used to make the user aware that they had task to do or changes in the applications.

Privacy

The interviewees realized that it is not easy to develop m-Government thoroughly, in the matter of security and privacy. The data protection and information collected are still in the standard basis and need improvements. The budget and human resources also restrain them to completely start the whole projects. They are now still developing web-based application with the privacy concerns to protect the data of the citizens, not be shared to other parties. For example, the permit application online, in which

the users input all the data information and the government make sure that the data collected will be safe and will not be used for other purposes.

7.5 Cross-Case Analysis

In this section, we explain the cross-case analysis from the results from each case study. Cross-case technique for analyzing qualitative multi-case studies is relevant if a case study consists of at least two cases [16]. The interview result with several word tables that display the data from each of the case studies and further explained for each domain.

Name of organization	Type of Government	Maturity Aspect per Domains							
		Techology Infrastructure	Security	Application Services	Policy	Knowledge Management	Organizational Factor	Privacy	User needs
MCIT	Central Government	2	2 to 3	2 to 3	2 to 3	2 to 3	2 to 3	1 to 2	2 to 3
Sragen District	Local government	1 to 2	2	3	2	2 to 3	2 to 3	1	2 to 3

Table 7: Maturity Level for Each Case Studies

The important difference for both cases is the types of Government. From the size of organizations central government is bigger than local government. The services given are also different, where MCIT provides services not just to the citizens, but also to local government and business stakeholders, while local government is mostly deliver services to their local citizens and the underneath agencies.

From the first case studies, as can be seen from figure 11, the privacy is on the lowest level of the maturity, still on stage 1 of the maturity. This means, the central government, especially MCIT, should be more focused on the privacy concerns regarding development of m-Government. Because, as explained before, privacy is related to data collection, therefore, trust should be built upon, which is also related to the security and human and organizational factors to achieve the next level of maturity.

From the second case studies, it can be seen in Figure 13, there are similar results with the first case studies, in which privacy is also in the lowest level of the maturity aspects. We also can see that the application service is the highest level of maturity which means that the local government-in this case Sragen regency, is quite successful to develop their own application to support m-Government implementation. They realized the usefulness of using mobile technology to helps them improve their back end processes to improve their work performances, decrease time and cost and create transparency as well as improve their front-end processes regarding to the public services delivery.

7.5.1 Technology Infrastructure

From the results of maturity assessment, for the technology including the infrastructure is still in level 2. Based on the interview from both local and central government, the quality of the website is not sophisticated enough. Each local government develops their own websites, with different capabilities and facilities. Mostly, it provides detail information with downloadable forms and email, some of them provide filling-a-form application services for making a permit or license.

The interviewees agree that for application services cross boundaries, standardization for data message formats is needed to well communicate between the services in all departments.

Moreover, there is still limited exchange information between government and citizens, but they do interact each other. Citizens can use their simple mobile phone to access the services as long as they can connect to internet. Nowadays, users are able to fill in the form online to make a permit, but the online payment mechanism is not available yet. Citizens should come directly to the government office or transfer to the bank account for the payment method. While, in the future directions, to decrease time and cost, it is possible to do the financial transaction online, as long as the security and privacy mechanism is fulfilled.

The government, also tries to develop various forms of collaboration and partnership with the private sector to increase ICT infrastructure access and coverage, especially to underserved and less profitable areas because information network infrastructure is important in addition to support decentralization process to bridge digital divide between urban and rural areas.

7.5.2 Security

From the perspective of security, the government has not been ready yet to implement mobile financial transaction. Secure service messaging is still in experimental mode. Even for the website itself, it is still vulnerable to be hacked. There are some cases, that the hacker change the information in the government websites. Therefore, it would take a long process for the government to provide financial transaction and going to next level, but it would be possible to implement faster in the future, with the help of third parties such as banking company. Because until now, business sides is one-step more advanced than the government did.

7.5.3 Application Services

The development of applications differs in each government. MCIT provides standardized policy and some of applications services and disseminated into each local government. The applications from

central government are coming not only from MCIT but also other ministries, for examples, application related to the residential administration system is provide by the ministry of home affair. Application related to the financial and tax, is coming from ministry of finance, and so on. In other hand, since the new regional autonomy law no 22 enacted in 1999, the autonomy of government is delegated to local or regional level in a number of areas. So, there have been significant changes in local government management. Each local government enables to develop their own application based on their need and budget, but the procedures refer to the national policy and strategy of the development of e-Government and the reference architecture is based on blue print of e-Government application system published by MCIT.

7.5.4 Policy

The Government of Indonesia recognized the need to create an enabling legal and regulatory environment to support ICT development by preparing ICT-related acts and ICT-related regulation to ensure a clear-guided and transparent framework, to facilitate interaction among stakeholder and the provision of national information infrastructure including covering remote areas. Central government responsible for creating and formulating the policy framework that can be used nationwide. Each local government has to refer to the regulations published by the central government even though they develop their own applications. For some applications that have been developed, the service level agreements were still in initial phase and the policy regarding the use of mobile devices including the third parties is developed ad hoc.

7.5.5 Knowledge Management

Within each case, the interviewee had a clear vision about how organizations could develop and apply m-Government as an addition to accelerate the delivery of public services. Communicating this vision throughout all top level management in each department is needed to reach one clear common vision so that they can communicate it again to their organizations, emphasizing the importance of using m-Government and the potential opportunities.

With regards to human capacity building, the government recognizes the enormous potential of ICT usage to extend and enrich human capacities. The utilization of ICT are critically essential. Training is also needed to enhance the skills and experiences of the government officers in terms of e-Government project. Knowledge and experiences were often transferred as best practices.

7.5.6 Organizational Factor

The commitment from the leader and financial support are seen as the most important enabler for m-Government development program, this is also confirmed by the literature [40, 45]. Some local governments do not see the importance of developing e-Government as a good investment. Therefore, the governments should commit to keep the potential of e-Government to deliver public services and provide transparency, accountability and participation to create good governance.

Financial support is also important aspect to noted, without proper funding, it is difficult to develop successful e-Government project. Based on the experiences, the limitations of funding caused the project went pretty slow because they develop the application, infrastructure one by one per year, depend on the availability of the funds.

7.5.7 Privacy

In the current situation, the development of e-Government projects is in level 1-2 on average, the government pays little attention to the level of privacy, because most of the citizens are doing basic access to the government without giving any personal information, like browsing the web portal, download information, asking a questions, giving a critique or comments, etc. Therefore, most of the answers from the questionnaire refer to level 1. It is strengthened by the interviewees that until this time, no personal sensitive data given online by the user. For the next development, the government realized the importance of the privacy, to develop trust of the citizens towards citizens' personal data, especially when they start doing financial transaction, involving online personal information disclosure.

7.5.8 User Needs

One of the goals of e-Government is to deliver the services to all target groups and level of user, including the citizens, business, governments and the employees itself, both in big cities and rural areas throughout Indonesia. The government tries to meet the user demand of the transparency, fast and reliable public services, by giving comprehensive information, easy access of the services and in the higher level is to control the information they need.

Before all the information is provided in website, citizens experiencing difficulty, for examples, to be able to obtain information about the requirements to make identity card or how much the exact amount should they pay for making a driver license. Before it is published online, the fees could be different one to another because of the fraudulency or corruption.

Nowadays, the public services are getting better and better, including the use of m-Government as one of the channel, so that people can access the information whenever and wherever they need without taking more time and money.

7.6 Summary

Two case studies were conducted to assess the maturity aspects of m-Government as an addition of e-Government. The two case studies were used to test the constructed stage maturity model in practice in two different types of organizations, central and local government. The case studies involved filing in the questionnaire as a maturity assessment tools together with semi-structured interview to get insight of the development of e-Government and m-Government within the organization.

A cross-case analysis was conducted, structured according to the eight maturity domains. The key point analysis that can be extracted from cross-case analysis are:

- The maturity level of m-Government as an addition of e-Government is on stage two of the maturity model. It proves with the assessment tools, both in central and local government
- The privacy domains is on the lowest level of maturity in both case studies, meaning that the government should realize and focus on the importance of the privacy concerns regarding the data collection, so that they can easily use mobile technologies for their back-end and front-end processes.
- Commitment and support from top-level management is important to successfully develop m-Government projects.
- The organizations had a clear vision and directions of the development of M-Government as an addition of e-Government program
- The financial support is important to fund the e-Government project.
- Standardization is considered to be important but the realization is difficult.
- All the eight domains is considered as a prerequisite for improving transparency and accountability in various government transactions, effectiveness in public services as well as increasing the efficiency of the decentralizations.
- Pay more attention to the security and privacy level as the preparation to going to the next stage (stage 3) that includes financial transaction.
- With the used of m-Government, it would be much easier for the citizens to access government services everywhere and anytime.

PART IV: CONCLUSION

8 Discussion and Future Work

Maturity models have been developed to assess different specific areas. Based on the maturity assessment, organizations can identify the gap between the current situation and their desired one. They could predict the extent to which activities that have the potential to achieve the desired outcomes.

Although literature proposes MMs of e-Government, there is no MMs that specifically address the m-Government maturity aspects with the two dimensions in matrix model-the stages and domains. In this thesis, we have introduced the stage maturity model of m-Government in order to improve e-Government services by utilizing m-Government features.

In chapter two, the background and definitions of e-Government and m-Government together with their potential aspects and challenges are presented. The research selected appropriate maturity model of e-Government and m-Government described in the literature based on different perspective (Chapter 3). Using the meta-ethnography methodology, the stage models are reviewed, compared and synthesized, in order to create the new five stages of m-Government maturity model as explained in chapter 4. The SMM m-Government domains are constructed based on literature review and validate with the experts (Chapter 5). The results of completed stage maturity model of mobile government (SMM m-Gov) are presented in chapter 6 together with the maturity assessment tools that were used for the case studies.

Finally, we validated the usability of our model in practice by conducting case studies using maturity assessment tools in two different government areas, as described in chapter 7.

This chapter, presents the conclusions of this thesis by discussing the research results. First, we review the research questions presented in chapter 1 (Section 8.1) continued by discussing the result contributions for both theoretical and practical fields (section 8.2). The limitation of the research is in section 8.3 and finally, potential research is described in section 8.4.

8.1 Reviewing the research questions

This research began by defining a set of research questions. In order to develop the SMM m-Gov, we formulated the main research question as:

'How can e-Government and m-Government be integrated to deliver government service in Indonesia?'

This research question was subdivided into three research questions, which are answered below:

RQ 1 *: How to develop an improved model to understand the linkages between e-Government and m-Government?*

To answer our first research question, we used several MMs of e-Government and m-Government that are available in the literature, presented in chapter 3. We used literature from e-Government and m-Government, because they both are related and linked to each other. M-Government can be seen as an additional channel of e-Government by using mobile devices and technologies. They had the same goals and vision, to deliver public services efficiently and effectively to the citizens, by creating transparency, accountability, as well as decreasing time and cost. We further described the main decisions made for the SMM m-Gov in all of part II Solution of this thesis. We illustrated how the design of the SMM m-Gov involves not only literature studies but also empirical studies.

The m-Government stages are developed by using qualitative meta-ethnography methodology (explained in chapter 3), by reviewing the available MMs, comparing the stages, translating the studies and identifying underlying concepts and synthesize the translation. From the meta-ethnography methods, we come up to the five stages of maturity model: Stage 1: Initial Phase - Information Publishing, Stage 2: Enhanced phase - Interaction, Stage 3: Reforming phase - transaction, Stage 4: Enrichment Phase - Fully integration and stage 5: Governance phase - transformation and participation. The m-Government domains were developed using the in-depth literature review with the combinations of using Gartner's four stage model and Sandy and McMillan model and approved by the validations process with the experts interviews.

From the analysis of the research methods, we constructed seven domains, but after the result of the interview with experts, we confirmed to add one domain: user needs. For the final results, we are able to propose a new set of domains of SMM m-Gov model: technology infrastructure, security, application services, policy, knowledge management, human and organizational factor, privacy and user needs (chapter 5).

The completed SMM m-Gov model is explained in chapter 6, together with the framework of e-Government and m-Government development, in order to be easily understood about the linkages of the e-Government and m-Government process. In short, m-Government is an addition of e-Government process to accelerate the delivery of services to the public in relatively faster time and lower cost.

RQ 2 : *Which stages and domains can be distinguished in the m-Government maturity model?*

In response to our second research question, the development of the model that answered in RQ1, results a propose stage maturity model, consist of five incremental stages and eight domains. The stage maturity model is depicted in the matrix model as explained in chapter 6 and depicted in figure 7 as below.

Stage Domain	Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Technology Infrastructure	Disjointed - Manual Infrastructure	Coordinated Infrastructure	Standardized Infrasructure	Consolidated Infrastructure	Fully consolidation - Government and stakeholders works in partnership
Security	Online activities track	Authentication	Confidentiality	Access control	Highly secure and accountable
Application Services	Basic application services	Basic application services with interactive session	Advanced application management	Scale optimization (	Application Orchestration
Policy	Policy on information / data collection	Policy on information use	Policy on data protection	Policy on information sharing	Policy on individual participation
Knowledge Management	Knowedge Resources	Stakeholders of knowledge management	Knowledge dimensions	Knowledge characteristic	Knowledge creation
Organizational Factor	Creating awareness	Creating trust	Creating choices (of transaction)	Consultation	Controlling
Privacy	Surreptitious data	Voluntary data	Personally sensitive data	Aggregation on information	Civil right and constitusional
User needs	Availibility of information	Accessibility of services	Usability of services	Personalizations	Control of information

This model is not specific to the m-Government but can also be used for the e-Government development, because the model has been developed based on several models coming from e-Government and m-Government literatures. In this thesis, we focus on the use of mobile government utilization to help e-Government implementation in developing countries, particularly in Indonesia. Hence, in the case studies, we used maturity assessment tools with the key indicators and the questions that are mostly related to the used of mobile technologies.

RQ 3 : *How can SMM m-Gov be measured and made operational?*

In order to validate and empirically confirm the operational of SMM m-Gov model (depicted in figure 7) in real life setting, the case studies were conducted in two different types of government, local and central government. By giving a questionnaire as a maturity assessment tools, the respondent answered the questions based on the current condition of the e-Government and m-Government development project, showed the level of their maturity. We also conduct semi-structured interview to strengthen the answered and to give detail explanations of the current conditions. The details of the case studies were explained in chapter 7.

8.2 Contributions

This thesis makes several contributions to both theoretical and practical fields, summarized as below:

8.2.1 Theoretical contributions

1. Our first theoretical contribution is the proposed stage maturity model of m-Government depicted in figure 8 in chapter 6. The proposed matrix model is new in the field of m-Government and consider as the first mobile government maturity model with its two dimensions, stages and domains.
2. As an addition to the domains, user need is an important aspect to be place into existing model. Here, the term of user needs means the government should know the needs of citizens, what they wants, how to make it easier to be accepted, and how to make them convenient to use the system.
3. The SMM m-Gov offers a scientific framework for the e-Government and m-Government development process, and has shown the linkages and similarities between both of them. It proved that m-Government is used as one of the additional channel to deliver services to the citizens by using mobile devices.
4. The maturity assessment tools can be used to analyze the level of maturity in the organizations and can be used to give recommendation for the organizations in order to move to the next stages.

8.2.2 Practical contributions

1. The case studies conducted in different types of government as well as the lesson we learnt from the case studies represent our first practical contribution from this research.

2. The model is not limited to m-Government areas, but also can be used in e-Government development. The difference is the technology being used. The government can assess the maturity level with different key indicators and different questions, depending on the needs of government.
3. The SMM m-Gov can function as a roadmap for government that are considering or already implement the m-Government project. They can assess their current maturity on different aspects and use it as basis to determine the goal for the next stage.
4. The SMM m-Gov is a generic model and can be used in other developing countries, and can be adjusted to the needs and priorities of the organizations.

8.3 Recommendations

Several recommendations could be derived based on the conducted case studies in Indonesia.

1. The SMM m-Gov together with its maturity assessment can be used to measure in which level is the government in current situation. Based on the case studies, Indonesia is relatively still in stage two of the maturity level. There are many things to do before it can go to the next level, because the third stage is related to the transaction phase, which needs deep concerns for each of the domains, especially for the security and privacy aspects. For now, the use of mobile technologies could help the government to increase the working performance and improve the interactions between the governments as their back end processes as well as their front end processes to deliver the services to the citizens.
2. The use of mobile technologies in developing countries is mostly with SMSs services, to be able to reach all of the citizens in whole area, including rural area. Therefore, to accelerate the implementation of e-Government, each local government should consider to use mobile technologies to speed up their services delivery, to reduce the cost, to make the citizens convenience and to access government services anywhere and anytime much easier. In the current situation, the position of the maturity level in Indonesia is limited in stage two of the development. For example, the SMSs services are used as a reminder, such as market price, disaster information or as an alert of renewal the identity card and so on, so that citizens do not need to go to internet kiosk or other place to access it. They are simply using their mobile phone to get the updates. Therefore, the use of m-Government could help accelerate the penetration of information throughout different society nationwide.

3. The privacy domains is on the lowest level of maturity in both case studies, meaning that the government of Indonesia should realize and focus on the importance of the privacy concerns regarding to the data collection, so that they can easily use mobile technologies for their back-end and front-end processes.
4. The organizations should have a clear vision and directions of the development of M-Government as an addition of e-Government program. Therefore, commitment and support from top-level management is important to develop m-Government projects successfully.
5. Until this time, some of local governments in Indonesia are striving to implement e-Government. Most of them failed or not able to move forward because of budget limitation and human resources incapability. Therefore, the government should try to use m-Government as an addition to the e-Government program that has already been implemented before to maximizing its delivery service. The used of m-Government resulting into reducing cost as well as eliminating time boundaries because government services can be made available 24 hours a day and 7 days a weeks.

8.4 Limitations

Although the SMM m-Gov has been designed and validated in practice, the model has still some limitations that might have influenced the results of this research.

1. We have mainly focused our research on the delivery of services, mostly from government to citizens (G2C). The experts interviews also focus on the delivery of services to the citizens. We do mention the interactions between G2G, G2B and G2E , but due to the limitation of time, we could not involved detail of those factors that can influence the construction of the model.
2. Because of the time constraint and the limited number of government in Indonesia that use m-Government, we only conducted two case studies, one represents central government and the other one represents local government. There are possibilities to do case studies in other local government in rural area, so that we will know whether there are any differences with the results.
3. Due to the time and resource limitations, we conducted small number of interviews. It was sufficient for a study like this, but on the other hand, another set of interview, questionnaire or a quantitative study could bring more clarity.
4. The key indicators of the stage maturity model have no weighing factors within their maturity aspect. We considered it to have an equal impact on their maturity aspect.

5. The experts said that the model could be applicable to other developing countries, due to the limited time and resources; we were unable to conduct the case studies in another country to prove the usability of the model.
6. Due to the time and resources constraint, we are not able to provide complete roadmap for the government with the time and detail steps and requirements for each level.

8.5 Further research

Looking at the limitations, further research can be conduct:

1. Further research should be more detail in the different types of interactions, including G2C, G2G, G2B and G2E. The research should include other third-parties organizations besides the government, such as private companies, telecommunication provider, etc.
2. Since SMM m-Gov may be applicable in e-Government development, further empirical research is needed to validate its applicability. The general possibilities of improving and extending the research come from current research limitations, for example, using quantitative study.
3. Detailed research to assess the need of the government for the whole m-Government project. Providing detailed requirements, and provide them with completed roadmap including the timeline, complete actions with the blueprint and guidelines.
4. Use weighting factors for each key indicator within a maturity aspect, to calculate an accurate overall maturity value for the organizations.
5. Conducting additional case studies came from local government in rural areas and also possibility to conduct the case studies in other developing countries as well to generalize the model.

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Appendices

Appendix A: Interview parts

Part	Description	Duration (estimated in minutes)
Introduction	Explaining purpose of the interview and what will be done with the information retrieved	5 minutes
General Information	Retrieving information about the interviewees: functions within the organization, years of experiences, field of expertise, etc	5 minutes
Interviews:	Investigate the opinion and the input from the interviewees about e government, m government, maturity model, etc	30-45 minutes
Wrap up	Closing the interview	5 minutes

Introduction

The interview is conducted as part of my project. The main goal of the research is to propose and validate a stage maturity model for m-Government implementation, in this case is specifically to Indonesia. The research aims to provide brief findings of the conceptual model and the recommendations for Indonesia to implement m-Government as a future e-Government.

The goal of this interview is to investigate the opinion from the experts on the possible aspects or domains on e government maturity model, as identified within this study so far. The initial model were provided based on the literature review, consist of five stages and seven aspects/domains.

The interviewed is conducted to retrieved more information, insight, and suggestion whether each of the domain is relevant for developing countries. Is there some aspects need to be add or deleted from the domain list.

The interview will be record, and start directly after the introduction.

General Information

1. What is your job title and your role in organization?
2. What is your role or function within the organization?

3. What is your field of expertise?
4. How many years of experience do you have in this function and or similar function?

Interview Questions

1. Do you have any experience in the field of government?
2. What is e-Government from your point of view?
3. From your point of view, is there any difference about e-Government in developing and developed countries?
4. What are the essential aspects the government should have in order to be considered as e-Government success?
5. From those aspects, which are the most important ones? Which aspects are needed first?
6. There are many different maturity models in e-Government. If you have any knowledge or experience about it, what kind of model would you like or suggest to use? What characteristics of a good maturity model do you consider useful?
7. What is m-Government from your point of view? Do you have any experienced with m-Government?
8. From your point of view, what is the key aspects of m-Government that need to address? It is similar with the e-Government?
9. If you see the model, do you have any suggestion about the stage (five stages)?
10. If you see the model, what characteristics or aspect do you expect to see in that model?
11. What do you think about the technology and infrastructure, do you consider as a separate entities or as one entity (ex. Technology is a part of infrastructure)
12. If we want to classified the domains into two aspects: technological and organizational aspects:

    Technical Aspects: Technology Infrastructure, Security, Application Services, Privacy.

    Organizational aspects: Policy/regulation, Knowledge Management, Human/Organizational Factors.

    Do you agree with the classification? Do you have any other suggestion?

    What do you think about the privacy? In which aspects should it classified?
13. In your point of view, will the m-Government works well in developing countries than developed countries?
14. What is your general suggestion regarding to the model?

Appendix B: Government Maturity Model

e-Government Maturity Model

1. Delloite's six-stage Model

Nowadays, Most of the government focuses on provision of services by the government in comprehensive way. The Delloite group reviewed that e-Government is an evolutionary transformation that affects the way in managed and delivered public service. It is also affects every aspect of how an organizations delivers service to the citizens, namely technology, business process and human resources. They put the customers as a central that makes a citizen-government relationship to be more inclusive and direct.

Delloite group proposed six stages of e-Government maturity model as follows [12]:

Stage 1: Information publishing

It's a one-way communication, each government agencies establishes their own website to provide information about themselves. By publish the information on the website, the citizens can reach the government easier and reducing the number of phone calls from the citizens who need information about government services.

Stage 2: two way transaction

In stage 2, citizens can submit their personal information and transact information with individual departments with secure websites. The citizens are able to have electronic interaction with the government services. Moreover, the security is a concern in this stages, each department should be able to keep all the information private and free from piracy by using digital signature or security keys.

Stage 3: Multi-purpose portal

A portal allows the citizens to use a single point of entry to send and receive information across multiple departments. It is a concept to meet broader user needs both within and outside government services.

Stage 4: Portal Personalization

In this stage, citizens are able to customize portal. Sophisticated web programming is needed to allow user customized their portals with their desired features.

Stage 5: Clustering of Common service

In this stage, citizens view the services as a unified package through the portal. Real transformation of government structures takes shape. All services clustered along common lines by government.

Stage 6: Full integration and enterprise transformation

In this stage, the silos services have been change into integrated technology. The government provide sophisticated, full service centre, personalized to each user's needs and preferences.

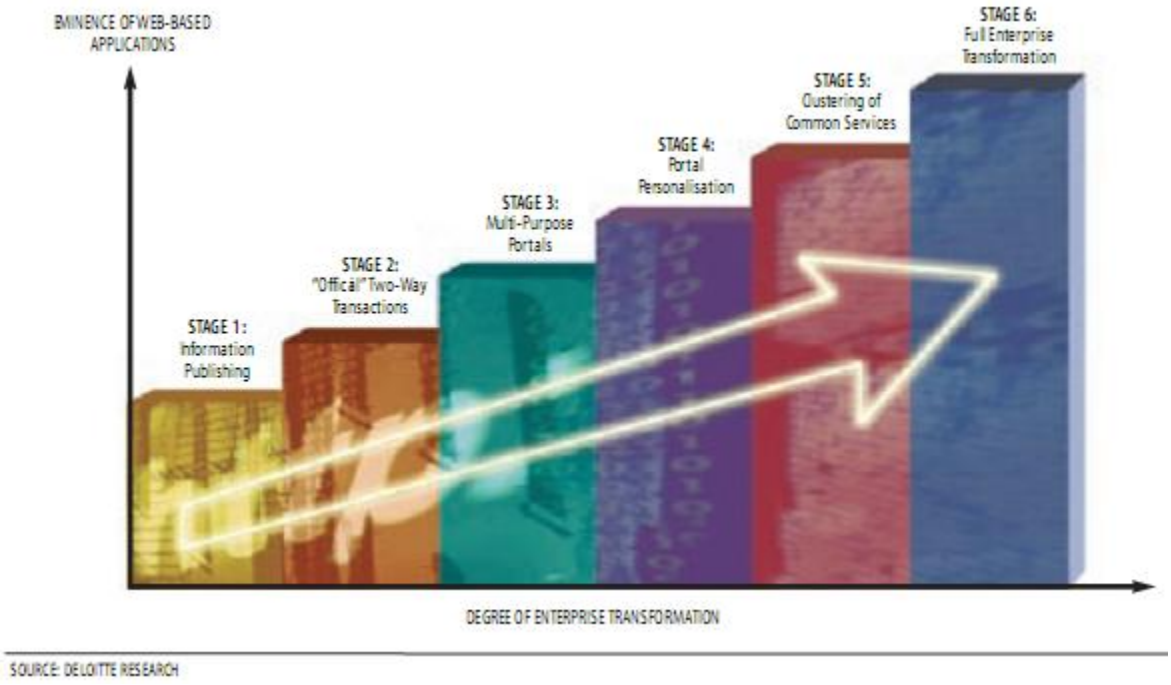


Figure 14: Delloite's six-stage model

2. UN five-stage Model

United Nation (UN) defined 5 stages of e-Government maturity model. Each of the stage is a gradually process for quantifying progress in order to achieve success [11].

Stages 1: Emerging

A limited web presence is established. Basic and static information of government provides through a few independent official sites.

Stages 2: Enhanced

The online presence begins to expand the content into dynamic website. Information is regularly update as its number of official websites increase. Hyperlinks to other departments, government publications and newsletter are available.

Stages 3: Interactive

In this stage, interaction between government and citizens is present. User can access broader range of government institutions and services. User can download forms, contacts the official and making appointment. The content is regularly updates.

Stages 4: Transactional presence

In this stage, government transform themselves by using two-way interactions online for 24/7. Complete and secure transaction provided. Secure sites, digital signatures and user passwords are also present. User can pay online for the financial transaction services.

Stages 5: Seamless /connected / fully integrated

All services across departmental boundaries are fully integrated, all in a "unified package". The services are clustering along common needs, it provides services across the different lines and level of department with the highest level of integration.

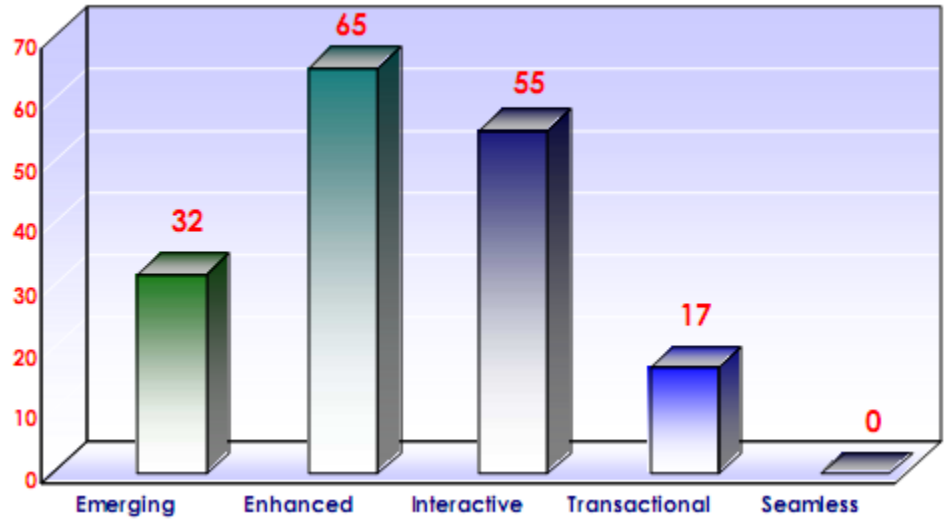


Figure 15: UN five stages model with the number of country positions in 2001 [11]

Furthermore, following to the UN e-Government stages model, in 2001, Indonesia's position is in the enhanced stages, which the content of the websites is regularly updated [6]. Search features, email address, government information, publications, and newsletter are available for the citizens to download.

3. Layne and Lee four-stage Model

Besides the model proposed by institution, some researchers also proposed some stages of the e-Government maturity model based on their research. Layne and Lee proposed four stages of a growth model of e-Government in terms of complexity and different level of integration [10].

Stage 1: Cataloguing

In this stage, initial efforts are focus on set up of an online presence for the government. The websites delivers static and basic information. The functionality is limited to online presentation of the government information and ability of downloadable forms.

Stage 2: Transaction

The capability is extended and allowing citizens to transact. This stage can be called transaction-based e-Government, by putting live database links to online interface so that the citizens or citizens enables to fulfill some simple online transactions such as pay fines, renew their licenses and filling out government forms.

Stage 3: Vertical integration

In their stage model, Layne and Lee, divide the integration into two, vertical and horizontal. Vertical integration, connect different levels of governments with different services within similar functionality. In this stage, initiates the transformation of government services rather than only the automation of the existing processes. Central database or a connected web of database is used, it is expected for each different levels of government, to be connect and communicate each other so that the results of transactions can be interchanged from one system with another.

Stage 4: Horizontal integration

This stage integrate different levels and across different functions of government. Varying functions of separate systems and different functional areas will communicate with each other and share information to provide citizens a unified services. The integration across different functions enables one department to automatically checks against data in other functional departments.

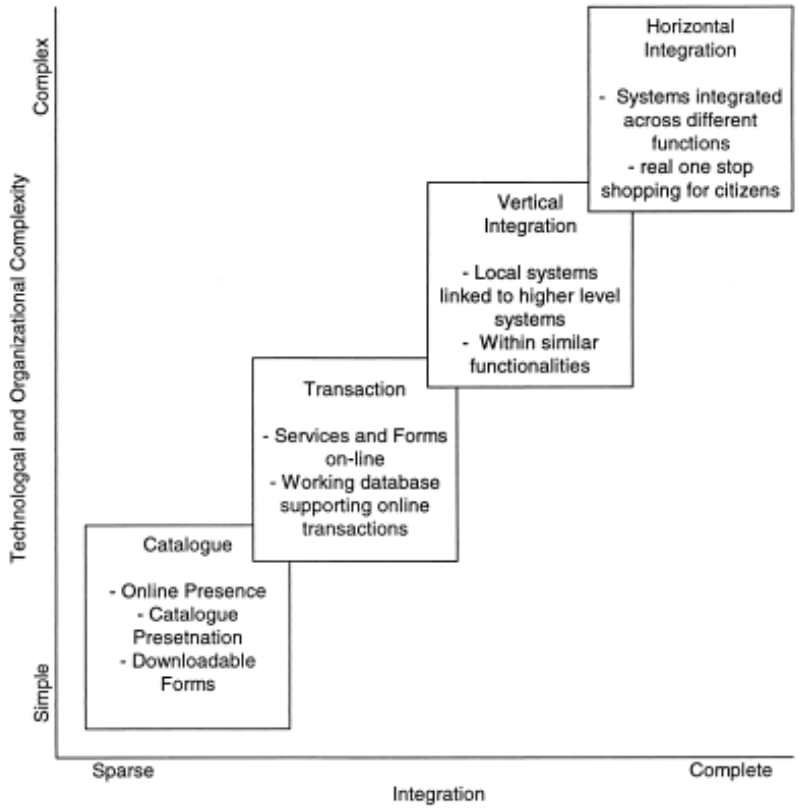


Figure 16: : Layne and Lee's dimensions and stages of e-Government development [10]

4. West's four-stage Model

Darrell West investigate in his research whether the interactive features of internet is useful to improve service delivery, democratic responsiveness and public outreach. He identified four stage of e-Government transformation as follow [36]:

Stage 1: The billboard stage

In the first stage, government set up a basic websites contain static mechanism to display information as same as billboards. The government reports, publications are accessible by the citizens but they cannot interact with it, so there is no two-way communication.

Stage 2: The partial-service-delivery stage

Citizens can access, manipulate information, and search informational databases. Some services online are provided, so that user can order and doing online services, access to what they need.

Stage 3: The portal stage

This stage provided fully executable and integrated service delivery. All different levels of government are fully integrates, so that improving citizen ability to find information and services. Security and public privacy is a highly concerns, translation options in multi language are available.

Stage 4: Interactive democracy with public outreach and a range of accountability measures

In this stage, governments are moves from service-delivery model to system wide political transformation. The websites offer a customize personalization and push technology, such as emails and electronic subscriptions, provide feedback, make comments and enhance democratic responsiveness. These all features help citizens to have interactive and two-way communications between citizens and government officials.

5. Gartner four stage model

Gartner had a research in e government phase model showed the progression of e-Government in the connected environment. The model proposed four stages maturity model as follows [37, 50]:

Stage 1: Presence

The government establishes a website to provide basic information about the government. Government reports and publications are available on the website.

Stage 2: Interaction

In this stage, some features are expanded, such as a downloadable forms, basic search capabilities, link to the other agencies or relevant sites and email address for interactions.

Stage 3: Transaction

The online transaction with good security is available in this stage, such as payment online, tax filling, receiving licenses or renewal the documents. This stage focuses on self-service application so that citizens can access it online.

Stage 4: Transformation

The government delivers fully integrated services among internal and external applications by providing a single point of contact as a central to the citizens in order to provide full communication between the official, citizens or other non-governmental organizations. As we can see in Figure 3, the transaction stages triggered the transformation stages, it means, by the time that the government can fulfill all the

requirement in the transaction stage, it can be goes to the transaction stage with all the integrated services [37, 50].

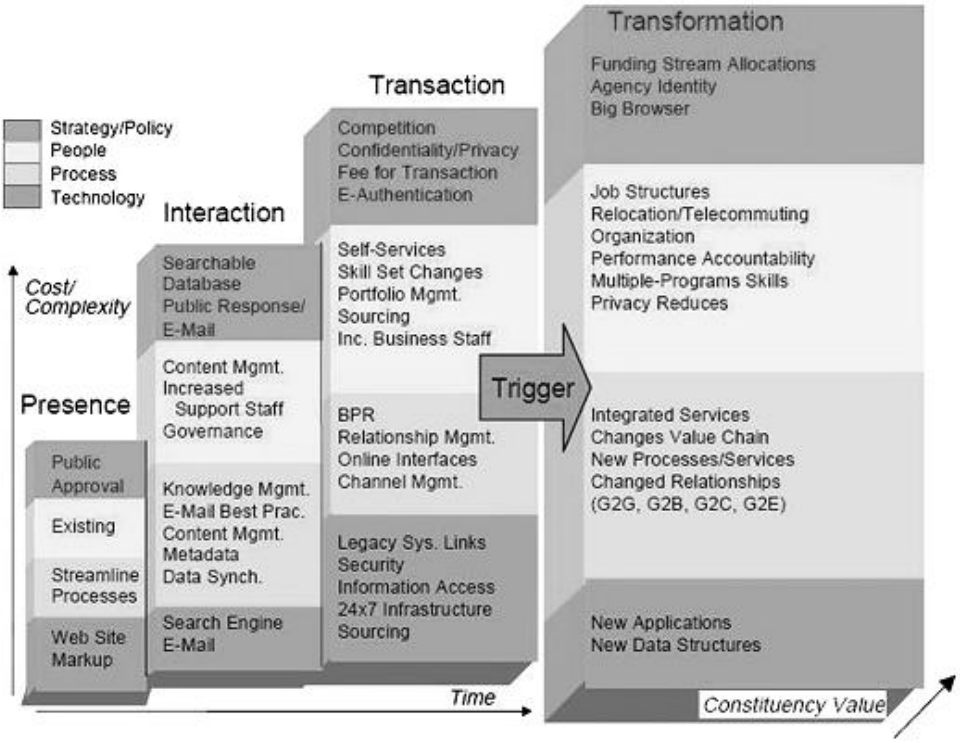


Figure 17: Gartner's four-stage model

Source: Cited from [50]

Based on the figure above, we can see that Gartner research had four domains supported the e-Government coverage area, namely strategy / policy, people, process and technology. They defined the requirement needed for each stage with the time, cost and complexity as an indicator. Meanwhile, the transaction cost, trigger the transformation stage with the constituency value as an indicator.

6. Hiller and Belanger

Hiller and Belanger defined five-stage e-Government maturity model as follow[38]:

Stage 1: Information dissemination

The government provides basic information and some government publications. They had to ensure the information si available and accurate.

Stage 2: Two-way communication

The two-way communication between government official and citizens are develops. Email system and data-transfer technologies provided. Citizens can fill in information request and having a feedback by email.

Stage 3: Transaction

In this stage, interaction between user and government is more interactive and including online transactions. Citizens conduct the financial transactions completely online, such as pay fine, taxes or renewing the licenses.

Stage 4: Integration

This stage provided fully integrated government services, both vertically-integration between different level of government (intergovernmental integration), and horizontally-integration between another department or non governmental agencies (intra-governmental integration).

Stage 5: Participation

In this stage, web-based public service is transform into web-based political activities. Citizens can involve into political participation such as online voting. Online opinion surveys, online public forums are provide. This stage also concerns with high privacy and requires high technology to support it.

Furthermore, Hiller and Belanger addressing a privacy concerns in e-Government implementation. The principles of privacy are used to represent the best practices in self-regulation. Figure 5 below illustrated A framework regarding to the privacy concerns for e-Government stages model.

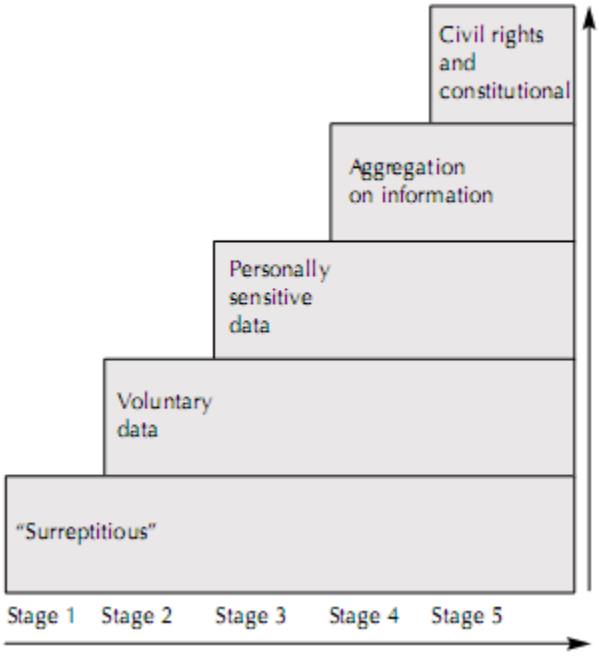


Figure 18: Level of privacy concerns in e-Government stage [38]

7. E government stage model of Indonesia

Following to the Presidential Instruction no. 6/2001, another Presidential Instruction contains a national policy and strategies pertaining to e-Government development in Indonesia was published, namely Presidential Instruction no. 3/2003. Meanwhile, to operate it into the needs of e-Government at the national level and to improve transparency and accountability of good governance, the Ministry of Communication and Information Technology published a master plan to guide the development of e-Government both to central and local government. [45] .

In this guidelines, there are four stages of e-Government development [39]:

Stage 1: Preparation

In the preparation stage including:

1. Each government agency (central or local government) should establish the website to provide basic information.
2. Training to the government officer regarding to the e-Government,
3. Provide public access such as Multipurpose Community Center (MCC), internet kiosk, etc.
4. Socialize electronic information to the citizens to create public awareness about e-Government.
5. Develop e-leadership for supporting the development of e-Government

6. Prepare the supporting regulations.

Stage 2: Maturation

In this stage, the website is develops into more interactive session. Search engine, and email are provided. Citizen and government having two-way communication between each other, there were also a hyperlink with other government agencies to enhanced interactive session with other government agencies.

Stage 3: Consolidation

Citizens are able to do the financial transaction. The services should be trustworthy and confidential, with reliable security. In this stage, integration of application and data with other government agencies (interoperability) are done.

Stage 4: Utilization

Full integration and utilization of the application between government to government (G2G), Government to Business (G2B) and Government to Community (G2C). In this stage, the government provides the best service to the citizens.

m-Government Maturity Model

1. Alijerban and Sahafi Maturity Model

By identified different models of e-Government maturity model, Alijerban & Sahafi propose 6 stages of m-Government Maturity model [28]:

Stage 1: Presence and disseminating information

All sites could be observed by mobile phone. Some basic services could be present, such as a weather, news, and access information

Stage 2: Interaction

At this stage, user can download information via mobile phone, give a comments in the website, received feedback and provide location-based services.

Stage 3: Transaction

Financial transactions and positioning services are presented in this stage. Security is a big concerns for the government to overcome. Personal detail information and privacy of the user should be keeps safely.

Stage 4: Vertical and horizontal integration

An integrated mechanism of communication between different departments and different governments are presented in this stage. The vertical and horizontal integration is not applicable through mobile technology, if the country has not reach the integration stage in their e-Government implementation.

Stage 5: Portal & personalization

A portal allows citizens to use single window to send and receive information, processing financial transaction, and personalize their user-interface. The services are given based on customer needs and placed in different categories

Stage 6: Electronic participation

In this stage, transparency, accountability should be implementing. If a government has not reach this stage, democracy cannot do its real role, because the government is not accountable. For example, E-voting can be done technically in stage 4, but not completely realize without transparency schema.

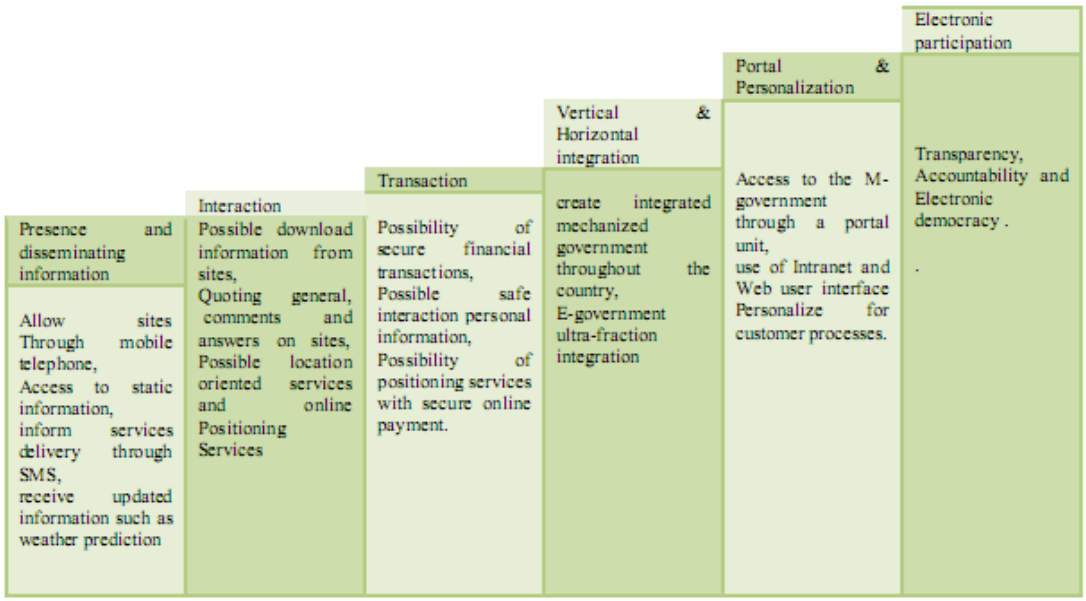


Figure 19: M-Government Maturity Model based on Alijerban & Saghafi

2. Fasanghari and Samimi M-Government Framework

To develop m-Government framework, the researcher also identified various e-Government maturity model as a foundation. Fasanghari and Samimi proposed the model consisted of six steps or five phases [13].

Stage 1: 0th phase

In this phase is a phase of e-Government. Citizens access the services with e-Government infrastructures and landlines phones

Stage 2: 1st phase

Access to the government information via mobile phone is possible in this phase, therefore the migration of e-Government to m-Government is needed.

Stage 3: 2nd phase

Primary interaction to the website via mobile phone, search capability is present in this stage.

Stage 4: 3rd phase

Citizens are fully interacts with the application of government services through mobile phones. The public service delivery is more convenient than previous stage.

Stage 5: 4th phase

Transaction is present in this stage, online interaction between citizens and government official for enforcement of the government services.

Stage 6: 5th phase

The services are is in ad-hoc situation. The government services are delivering based on real-time situation (such as information about earthquake, terrorist attack) without any request from the citizens.

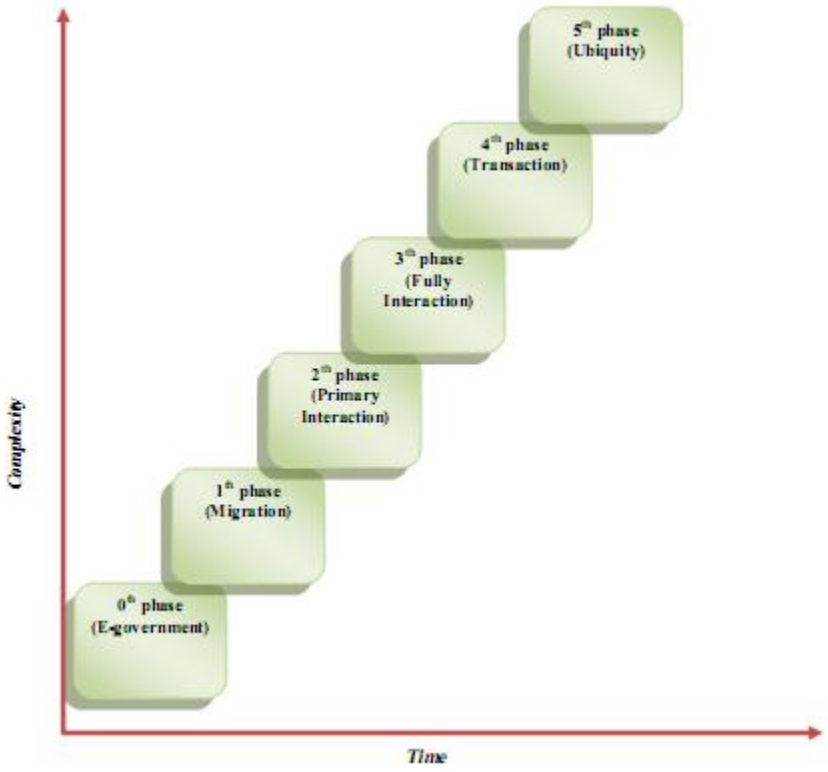


Figure 20: proposed e- government framework by Fasanghari & Samimi

We can see in the figure 5, the first stage of the model is the 0 phase, which is a preparation phase. In this phase, the government still used the e-Government infrastructures while preparing to the migration phase. They started to have the mobile infrastructure in the second stage. They argued this model is suitable for the developing countries that have low investment on e-Government infrastructures, because the use of mobile technology helps the government to deliver a real time and up to date information to the citizens.

3. Sandy and McMillan m-Government stages model

Sandy and McMillan presented five levels of functionality in electronic service delivery in the field of mobile and web presence which is positively correlates with the level of m Government sophistication [40]. They identified five stages model with the critical success factor for each level.

Stage 1: Initial

This stages provides initial wireless access and non interactive responses such as response to complaints or questions from the citizens.

Stage 2: Enhanced

In this stage present updated information for the citizens, such as weather forecast, policy changes or traffic conditions.

Stage 3: Interactive

Provide interactions between citizens and government service providers. Searching features is available, so that users can search for the specific database based on their needs and interests. Users can fill in the forms, download forms, and submit them from mobile devices or wireless connections.

Stage 4: Transactional or mature interface

Unique or single-entity interactions for mobile and wireless users are provided. A single mobile government agency is used for the user application. In this stage, a simple and non-critical payment interactions are provide, which is simple transaction.

Stage 5: Fully interactive

In this stage, high security for mobile wireless transaction created, for payment, ordering and billing. It offers 7/24 services and can be access anywhere from a mobile wireless device with secure identification and authorization.

In their paper, Sandy and McMillan identified the critical success factors for each stage. Cost, business re-engineering, education, acceptance, security, and access are six factors to endorse the successful of government services using M-Government.

Appendix C: Maturity Assessment Tools

The maturity assessment tools can be used to assess the maturity of the m-Government implementation in the organization. The assessment tools is consist of a set of the questionnaire that constructed based on the 5 stages and 7 maturity domains/aspects.

The questions represent the indicators described in the previous section. For each key indicators, 5 scenario's have been described that match for each of the stages. The respondent is asked about the best scenario that fits the condition in the organization. There are an option of 'no opinion' If the respondent does not know the answer of the questions or not willing to answer. There are also a 'additional comments' to accommodate the input or feedback from the respondent.

1. Technology Infrastructure

This domain describes all the aspects related to the physical infrastructures, such as network, information exchange format, tools, equipment, data standarizations, etc. Those key infrastructure existed in order to provide mobile wireless connections to all constituent. The technology used should fulfilled the demands and enable various potential applications. Government should strengthen the telecommunication and network infrastructure, since m-Government used mobile equipments as a tools.

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Disjointed - Manual Infrastructure	Coordinated – Manual infrastructure	Standardized Infrasructure	Consolidated Infrastructure	Fully consolidation

This domain is subdivided into 5 key indicator: quality of the website, type of network, type of mobile devices, data standardization, tools and communication format.

1. How would you describe the quality of the website in your organization?
    a. The website provides basic web technologies, published information and government publications
    b. The website provides downloadable forms, email, and search engine features.
    c. The website provides filling-a-form application services, supporting online financial transaction services

d. The website provides universal services across multiple department (one-stop portal), users can customize the portal. System integrated across different functions
e. The website provides sophisticated, unified and personalized services to the user regarding their own need and preferences. User can participate in political participation
f. No opinion

Additional comment:

2. What kind of network that can be used in the development of m -Government?
   a. It using basic network such as GSM, GPRS, 3G
   b. It using 3G, Edge, Wifi, UMTS
   c. It using UMTS, Wifi, HSPA,
   d. It using LTE, Wifi, Wimax,
   e. It using HSPA, UMTS, LTE, Wimax and Broadband satellite
   f. No opinion

   Additional comment:

3. How is the messages format between the services standardized?
   a. Different message formats and techniques are used to exchange information
   b. Standard message formats are tested to communicate between the services within the boundaries of a pilot project
   c. Standard message formats are used to communicate between the services, but different from each departments
   d. Data message formats and protocols are harmonized internally within the organizations. Open standards for message formats are used to communicate between the services in most of all departments
   e. Data message formats and protocol are harmonized, both internal and external. Open standards for message format are used to communicate between the services, throughout the organization, both internal and external.
   f. No opinion

   Additional comment:

4. What do you think are the most useful tools for the user to use the services in the current situation?

a. Simple mobile phone
b. Mobile phone with 3G and wifi connection
c. Mobile phone with wifi connection, PDA, Smartphone
d. PDA, Smartphone, Tablet PC,
e. Smartphone, Tablet PC, Netbook
f. No opinion

Additional comment:

5. Identified the communication format between the government and user:
   a. Communication between the government and its user is limited. User is able to browse and download information without giving a feedback
   b. There is two-way communication between government and user with specific requirements, there is also limited exchange information about the services and procedure
   c. Formal communication links are established between government and user. Government should build a trust, so that user can easily access and doing transaction online
   d. Formal communication link are synchronized between all the departments and allowing real-time two-way communications throughout the organizations.
   e. Formal communication link are fully integrated and synchronized, both internal and external between government bodies, business partner, user, etc.
   f. No opinion

   Additional comment:

2. Security

This domain describes the fundamental security requirements. The government must overcome the mistrust by confirming the user identities and controlling access of the users activities. Furthermore, wireless network are vulnerable of being attack or hack to steal important information because they use public airwaves to send the signal [27]. It is essential for the users to have a trust when doing a financial transaction over the mobile phone, for example sending their credit card information.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Online activities track	Authentication	Confidentiality	Access control	Highly secure and accountable

This domain is subdivided into 3 key indicator: Messaging security, wireless network security and the mobile devices security mechanism

1. How is security of messaging integrated within services in the current situation?
   a. There is no framework for security of services messaging
   b. Experimentation is done with securing service messaging
   c. Secure service messaging is applied within each department
   d. Secure service messaging is integrated into a centralized service messaging framework
   e. Secure service messaging in an inter and intra organizational framework
   f. No opinion

   Additional comment:

2. Identify the the protection level of the wireless network security
   a. Procedures for new user, example by user login
   b. Procedures for authentication of authorized users
   c. Procedures for the limitation of access control: user can change, delete or update an information, encryption is provided
   d. Procedures for the access control to those authorized, controlled access only to own personal information
   e. System are protected from outside access
   f. No opinion

   Additional comment:

3. Identiy the security mechanism in the devices
   a. The devices does not provide any security mechanism
   b. The user can configure the mobile devices to avoid untrusted wireless network access point
   c. User can change their authentication credential frequently, no storing in the mobile devices or storage cards unless it is encrypted.
   d. The handheld device suport SSL/TLS session layer security and possible to VPN software

e. The user can empower the access control of the mobile devices in more advanced mechanism, such as biometrics and smartcard.

f. No opinion

Additional comment:

3. Application Services

This domain describes the application services provided by the government to fulfill satisfaction of the citizens. This domain is subdivided into 3 key indicators: level of application services, scope of application services, application services governance

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Basic application services	Basic application services with interactive session	Advanced application management	Scale optimization	Application Orchestration

1. Identify the application services provided in current situation
   a. Present basic information, SMSs message services
   b. Users are possible to contact government officer, submit forms, using email, SMSs and MMSs
   c. User can register and making a permit online, handling online financial services, pay fines and transaction services
   d. User can do portal personalization: edit, add, delete, etc, based on their preferences. New integration of application, data structured and interface between department are provided
   e. Provide public key infrastructure, sophisticated application and interoperable technologies. Portal personalization and able to participate in survey, online voting.
   f. No opinion

   Additional comment:

2. How would you identify the scope of application services development?
   a. Application services are not developed
   b. There are some experimental application services developed ad hoc in pilot project
   c. Application services are developed in one or some departments

d. Central application services are developed in throughout the organizations and in most department
e. Central application service are developed and offered to internal and external such as business partner.
f. No opinion

Additional comment:

3. How would you describe the application services governance?
   a. Application services are not described
   b. Application services are described ad hoc
   c. There are standards to describe the application services but different for each department
   d. All internal application are described consistently in a standard way through all departments
   e. All internal and external application services are described in standard way, both within the government or with the business partner
   f. No opinion

   Additional comment:

4. Policy

This aspect considered the strategies and policy requirements to anticipate potential change because of user demands and increased involvement of citizens [57].

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Policy on information / data collection	Policy on information use	Policy on data protection	Policy on information sharing	Policy on individual participation

This domain is subdivided into 2 key indicator: policy specific, Service Level Agreement.

1. How would you identify the policy in the current situation?
   a. Policies are developed ad hoc. Users informed by the privacy statement regarding to the data collection
   b. The policy about the information use, how the data is collected and how it is used.

c. User had a choice of the access chanel and security means. The policy is centralized within each department

d. User can be noticed of the review and correction of information, notified when the data collected and release to other parties. The policy is applied throughout the organization.

e. Policy consistent with disclosures, there are a person in charge of the policy. The policy is used or internal and external parties

f. No opinion

Additional comment:

2. How would you describe the support for the Service Level Agreements (SLAs) ?

a. No SLAs are defined

b. Some initial SLAs are defined

c. There are best practices for defining SLAs for the services

d. Defining and monitoring SLAs and standardized within all departments

e. Defining and monitoring SLAs and institutionalized for intra-organizational services throughout the organizations

f. No opinion

Additional comment:

5. Knowledge Management

Knowledge management provides mechanism for distribution of knowledge, including the mental, behavioral, and cultural shift to improved customer satisfaction on government services. It elucidate the procedures, to access, use, share, and update the knowledge related to the government and how to use IT to support knowledge management.

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Knowedge Resources	Stakeholders of knowledge management	Knowledge dimensions.	Knowledge Characteristic	Knowledge creation

This domain is subdivided into 3 key indicator: Government vision, digital skills and Government expertise

1. How would you describe the vision of the future e-Government
   a. Some people have thought about the future of the m-Government
   b. There is a vision of the future m-Government per each department
   c. Most of the department share a same vision of the future of m-Government
   d. There is one clear vision about the future m-Government shared throughout the organization
   e. There is one clear vision about the future m-Government shared throughout the organization and on inter-organizational level
   f. No opinion

   Additional comment:

2. Describe the digital skills in your organizations
   a. Operational skills, skills to operate the digital media (able to operate internet browser, online search engines and completing online forms)
   b. Formal skills, the skills to handle the structures of digital media (using hyperlink, able to navigate when browsing and searching in the internet, using short message services)
   c. Information skills, The skills to locate information in digital media (selecting information, using applications for transactions, evaluating information sources)
   d. Strategic skills, the skills to employ the information contained towards personal and professional development (able to make right decisions to reach the goal, integration between agencies and department)
   e. Development skills, the skills to develop the creation and participation of all level participants
   f. No opinion

   Additional comment

3. How would you describe the professional experiences/ skill regarding to the project?
   a. Few people had skills in e-Government project, mostly use a consultant companies.
   b. Some people in some departments had skills in e-Government project
   c. Each departments had an expert, experienced in e-Government

d. Most of departments within the organization had an experts
e. People throughout the organizations had an experts in the m-Government project
f. No opinion

Additional comment:

6. Human and Organizational Factor

The Organizational aspect is identified the behavior of the people in the environment. This aspect is subdivided into 4 key indicators: Commitment from top level, funding, user participations and government awareness.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Creating awareness	Creating trust	Creating choices (of transaction)	Consultation	Controlling

1. How would you describe the commitment at the top level?
   a. The top level is unaware of the project or does not see that the project as a prospective future opportunities.
   b. The top level may know about the pilot project that are running and gives a support
   c. The top level identifies the project as a critical factor and gives a support within each department
   d. The top level fully support the project throughout the organization
   e. The top level fully support the project internally and externally, within the organization and in business collaboration.
   f. No opinion

   Additional comment:
2. Identify the available funding in the current e-Government project
   a. The funding is limited to the creating of the website
   b. The funding is limited, central government support the local government for the development.
   c. The funding is quite enough to develop new mobile applications, local government has their own funding
   d. The funding is big enough, from the central to the local government to integrate

e. The funding is does not matter, government provide the funding for all implementation

3. Identify the actors involved in giving a services
   a. End user, government, telecommunication provider
   b. End user, government, telecommunication provider, service provider, content provider
   c. End user, government, telecommunication provider, service provider, content provider, system provider, Software provider
   d. End user, government, telecommunication provider, service provider, content provider, system provider, software provider, equipment provider, regulatory body, standardization group
   e. All users
   f. No opinion

   Additional comment:
4. How would you describe the m-Government awareness in the project?
   a. Some people are aware of the services
   b. Some people knows about the pilot projects and people participating in the project are having knowledge and experience with the e-Government
   c. There is awareness within most department and a lot of experienced people involved in the project
   d. There is awareness throughout the organizations. Government is trusted as the consult institution.
   e. There is an organization-wide awareness for the internal and external parties. Government, business partner, and citizens are together can controlling the development
   f. No opinion

   Additional comment:

7. Privacy

The privacy aspect addressing privacy concerns regarding to the data collection. The government must ensures that citizen's privacy is protected and the information will not be share to the third parties or unauthorized parties.

Stage 1: Initial phase – Information Publishing	Stage 2: Enhanced Phase – Interaction	Stage 3: Reforming Phase – Transaction	Stage 4: Enrichment Phase – Fully integration	Stage 5: Governance Phase – Transformation and participation
Surreptitious	Voluntary data	Personally sensitive data	Aggregation on information	Civil right and constitusional

This aspect is subdivided into two key indicators: data protection, information collection.

1. How would you identify the privacy concerns in the current situation?
   a. Permission is obtained to store information on the user's devices (example: cookies)
   g. User can collected identifiable information and given clear and conspicuous choice.
   h. Personally identifiable information is accurate and complete for intended purpose, user can having a privacy of a private information, sharing limited to essential parties and notified when data is collected.
   i. Procedure for assesing the third parties with whom the information is shared
   j. User has the highest privacy concerns regarding to the fundamental right of the citizens
   k. No opinion

   Additional comment:

2. How the government collected the mobile-specific information?
   a. Personal information is collected, such as name, date of birth, identification number
   b. Other personal information is collected. User can give their phone number to received message, alert or reminder
   c. Collected information in user account. Government can use the personal information to handle billing disputes
   d. Use all the information to process and personalize user request, to develop new features and improves cooperation between the agencies
   e. Use the information to show the user a history of their activities in the website, provide with the statistics about the use of services. Provide better user experience
   f. No opinion

   Additional comment:

8. User needs

To match the solution to the problem, the government need to meet the needs of the users and the government goals. Government need to discover what challenges to be address do deliver the maximum service to the citizens. To know what user needs and what user wants.

Stage 1: Initial phase – Information Publishing	**Stage 2: Enhanced Phase – Interaction**	**Stage 3: Reforming Phase – Transaction**	**Stage 4: Enrichment Phase – Fully integration**	**Stage 5: Governance Phase – Transformation and participation**
Availibility of information	Accessibility of services	Usability of services	Personalizations	Control of information

This aspect is subdivided into two key indicators: Target groups and user readiness.

1. Identify the target group of the m-Government project
   a. Citizens in all ages
   b. Citizens, in all ages, including rural area which cannot be afford with the wired connection
   c. Citizens and business stakeholders. Using their devices to make their life easier to do transactional services
   d. All the citizens, government officers, and business stakeholders
   e. All users
   f. No opinion

   Additional comment:

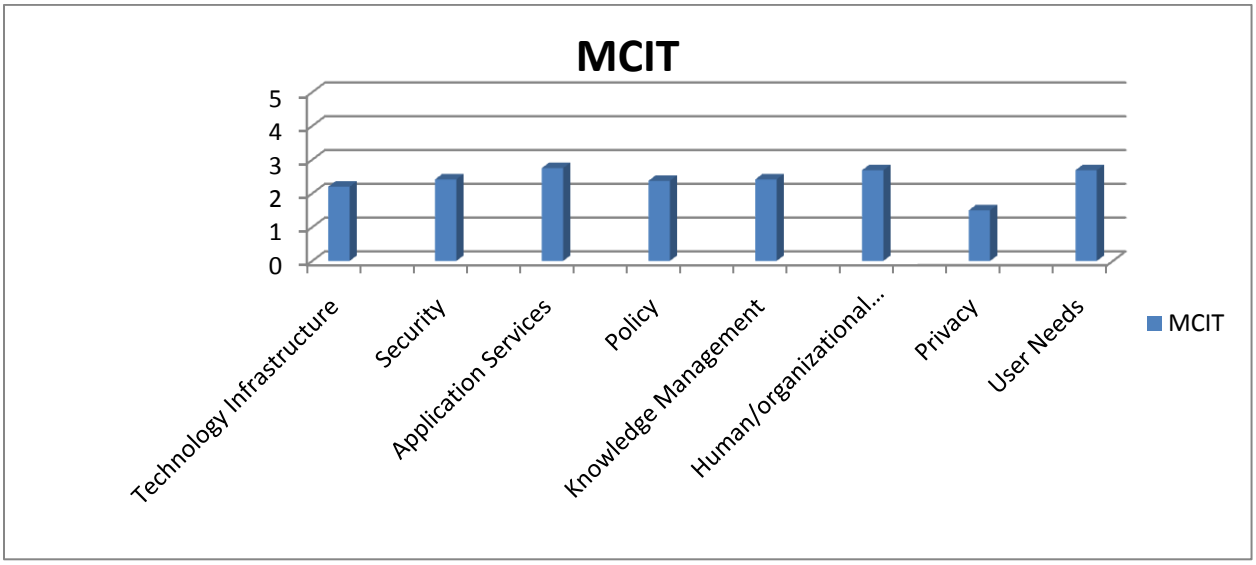
2. Identify the user readiness in the m-Government project
   a. Users were not well-informed about m-Government project
   b. Users do not have a clear picture of what is m-Government
   c. Users views the m-Government as an addition to e-Government
   d. Users have a key role in the information society building process as a services beneficiaries
   e. Users participate in the process of information society building
   f. No opinion

   Additional comment:

Appendix D: Case Studies Results

See Chapter 7 – Case Studies

1. MCIT



Technology Infrastructure

For the technology, the level of assessment is, on average level two, coordinated-manual. MCIT has set the standards for the development of e-Government but not yet fully implemented in the local government. Each local government also develops their own applications which are different to each other . For example the majority of the local government websites provides static web technologies, but there are some of them which provide dynamic websites with the downloadable forms, email and search engine features. The standard message formats are used in some pilot projects. In this level, for the development of m-Government, simple mobile phone with the capability to browsing is the most popular devices, since SMSs is primarily used for two-way communication within the government or with the citizens using SMSs services.

Security

To develop the trust, security is the one of the most government concerns while developing m-Government. Some of local government provided procedures for authentications, and using secure service messaging. The security mechanism of mobile used is by configuring the mobile devices to avoid

un-trusted network while their browsing and accessing the website from mobile phone. Currently, there is no transactional phase yet, but there are an efforts to get there with the cooperation with banking companies with simple applications (still on-going project).

Application Services

The central governments provide standardizes application for some projects, for example: e-procurements application for the process of procurements of goods and services. Offices application to help the back end processes of each local government. Indonesia National Single Window, is a system which enables single submission of data and information for import and export trades. Residential administration system to record the number of resident in each local areas (population) and so on. Furthermore, each local government has their own budget to develop new applications based on their need and requirements and used internally in their government.

The applications are developed in each department and mostly used web-based application so that they can access it everywhere, they also used SMS gateway services for some applications as a reminder. For the front office processes, citizens can download and submit the forms in the websites, send the SMSs complaints and other activities limited to the two-way communication without any transaction stages.

Policy

As a regulatory body, MCIT create a policy for some applications and regulation. But still, the level of the policy mostly in the information use, about how the data is collected and how it is used and some of the policy is about data protections. For example, the law concerning public disclosure. Moreover, some regulations and policy for each local government is different one to another.

Knowledge Management

For the development of e-Government projects, some people in the departments had skill in the e-Government project. For central government, usually they had an expert, having many years experienced related to e-Government project. For large scale of the project, MCIT also used consultant companies to help them because lack of the number of human resources that are capable with the e-Government project.

Furthermore, regarding to the government vision, there is a vision from the top level of using m-Government for future directions to help accelerate the development of e-Government. But for local government, few numbers of them have thought about m-Government because they are still struggling

with the development of their own e-Government, especially to make their website to be more informative, powerful and sophisticated.

Organizational Factors

Central government has their own limited funding to develop e-Government until the local government, such as providing training, workshop and giving socialization to the government officers. On the other hand, the local government also has their own funding to run the e-Government project or develop an application system, but anyhow, the funding is limited per year. The project is developed annually based on the budget they had. Therefore to accelerate the growing of e-Government including m-Government, stakeholders (business and private company) are also included in the project, especially telecommunication provider, since most of the applications used SMSs services.

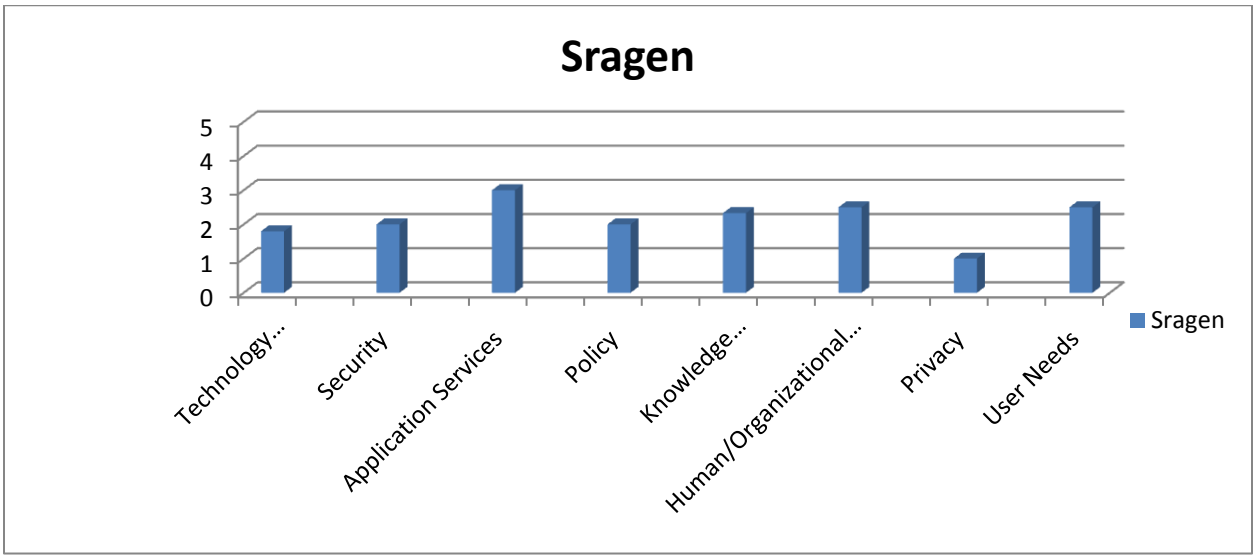
Privacy

The privacy, regarding to the data collection, should be considered when developing m-Government projects. The government should ensure that the citizen's data will not be shared with third parties without end user permission - especially when they had cooperated with private companies. The application procedure consists of providing personal data such as their name, birth date, address or phone number should be used for its intended purpose. Low level of privacy is occur because there is no trust from the citizens to the government. Internet users may be inclined to do things-especially transaction- online because of data sensitivity and risk perception [61].

User Needs

M-Government project is intended to be delivered to the public, government officers and business stakeholders. Currently, most of m-Government project still develop for internal used such as back office management information system, used by the government for the back-end processes, such as office applications, disposition application, which helps the officer to improve their performance by reducing time and cost.

2. District of Sragen



Technology Infrastructure

As can be seen in their website, in the scale of local government, Sragen regency is commencing advances in terms of the quality of the websites. It provides downloadable forms, detail information, and search engine features. They also had website for each agency. The agencies responsible for the development of e-Government is ICT & electronic data center agency, and they are willing to intensify their website to the next level that provide filling-a-form application process and support online financial transaction. For the network, they used wired and wireless network. Wired is limited in the mayor office and some agencies, and connected to the ICT & electronic data center agency. While wireless, with the frequency of 2,4 GHz and 5,8 GHz is connected between the ICT & electronic data center agency with the regional work units until the sub-district, villages with the total of 328 points.

The communication format is still in the level two-way communication with limited exchange information, but trying to go to the next direction, for example, providing online permit application to make it easier to citizens and business stakeholders who want to invest in the District of Sragen.

Security

For the wireless network security, they provide authentication of users and provide access control for different users. Most of the applications is used for internal or back end processes until the regional work units, while for the mobile devices, they do not provide any security mechanism yet, since they

build the application based on web-based application which can be used online from mobile devices (not specifically mobile application).

Application Services

The government of the Sragen regency, develops many in-house application throughout the organizations and were used in most agencies/department. They provide back office and front office management information system and they had standard for the applications (ICT & electronic data center agency created it and send it throughout other agencies and regional work units).

Some of the application developed by Sragen regency were: Electronic office application (e-office), are used for exchange information vertically between agencies until the sub-district and small village. Electronic letters application, are used to correspondence between agencies and departments, electronic disposition application, personnel management information system, payroll management information system, monitoring information system, healthcare information system and many more.

On the other hand, the front-end application provided by Sragen regency are: the front office management information system that can be used to communicate with the citizens, Sragen web portal, geographic information system (textual, graphics and spatial data), resident administration information system, permit application, e-procurement, regional market and trading information system, library information system, and many more.

Most of the application can be used in mobile devices. Based on the interviewee experiences, most of the time, he used mobile devices using e-office applications, e-letter and e-disposition application to stay connected with other employees while he was mobile in another areas, to give a direction or disposition to subordinate, and so on. SMS notifications are used to make the user aware that they had task to do or changes in the applications.

Policy

Beside the policy from the central government, each local government also has their own policy regarding the development of e-Government, especially when they develop new application or procedure to their agencies, sub-district and other regional work units. But local government still has to follow the national rules and policy from the central government.

Knowledge Management

As a local government which advanced in the development of e-Government, most of the agencies in the Sragen regency has thought about the future use of m-Government. As they share same vision to be smart regencies, they need multiple channel to achieve it. One of them is using mobile devices to helps them communicate and interacts faster wherever they are. The same problem are facing by each of government, lack of capable human resources. Typically, old-age employees are unable to use computer or other electronic devices, so there are few numbers of people which are able to help the development of e-Government. Some strategic plans are obtain by the top management to minimize the problems. They put young-ages and capable government officers in the ICT & electronic data center agency so that all the development of e-Governments are centralized in this agency and then spread throughout all organizations.

Organizational Factors

For this concern, even though the Sragen regency has limited budget regarding to e-Government project, the top level fully supported the project throughout all the organizations until small units in rural areas. Moreover, top level knows about m-Government project and willing to develop it. Some of experienced people that are hired also had plans to cooperate with other parties, mostly the telecommunication, banking and service provider because they had more experienced in terms of mobile applications.

Privacy

The interviewees realized that it is not easy to develop m-Government thoroughly, in the matter of security and privacy. The data protection and information collected are still in the standard basis and need a lot of improvements. The budget and human resources also restrain them to completely start the whole projects. They are now still developing web-based application with the privacy concerns to protect the data of the citizens, not be shared to other parties. For example, the permit application online, in which the users input all the data information and the government make sure that the data collected will be safe and will not be used for other purposes.

User Needs

From the beginning, the plan to use information and communication technology is to fulfilled the needs of citizens and to faster their processes to deliver the public services to all of the citizens, including in the rural areas.

Sragen regency has 20 sub-districts, and 200 villages which most of them is rural areas without internet connections. But with the advances of telecommunication infrastructures, the mobile networks are available and provide them opportunity to have mobile devices and connected with those mobile devices. Therefore, the development of m-Government is very important as an addition of e-Government to helps encompass all users until the rural areas.