Development of System Dynamic Models for Improving E-Governments Performance Local Governments in Lampung Province

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Abstract: *The development of communication and information technology requires the adaptation of all elements of society, including Government of Indonesia. Referring to the various dynamics of e-government problems, it is deemed necessary to develop dynamic system model to improve the e-government performance of local governments, especially in Lampung Province. The research is aimed at developing a model that can be simulated for improving e-Government performance by measuring the qualitative contribution of each component, both the ICT component and the social component that will be produced in this study, which can be useful for every local government in Lampung Province in accelerating and developing e - government. The research's model is done using VENSIM application for modeling and simulating complex systems in a variety of variables to improve the local government performance. This research finds that there are five main variables that constructed the improvement of e-government of local government performance: (1) e-government policies, HR, infrastructure, and management; (2) service, (3) performance, (4) community/user, and (5) quality of community life. The dynamic model can be further seen in the appendix.*
Keywords*: E-Government; Development; Dynamic Model; ICT; Social*

Introduction

The issue of the contribution of ICT to the welfare of society is still often questioned, especially in terms of its contribution to the government's performance. However, econometric analysis at the UNCTAD (United Nations Conference on Trade Development) in 2011 resulted in the conclusion that penetration of ICT by 10% in broadband will provide an increase in the economy of 1.38% in developing countries and 1.2% in developed countries (Bieron & Ahmed, 2015).

Furthermore, as found in Bieron & Ahmed (2015), from the results of the UNCTAD analysis, the countries in the world agree that implementing ICT in government would stimulate prosperity among communities, with the belief that ICT Governance is aimed at good government. Implementation of ICT in government, hereinafter referred to as "e-government," is expected to reduce bad practices in the field of public services, such as low quality of service and low integrity of public services.

The Indonesian government is often pointed out as lacking in more open, democratic, efficient, and effective public services, or what is often called good governance. Some researchers even consider Indonesia's government to be left behind in implementing Information and Communication Technology (ICT) in its governance (Furuholt & Wahid, 2008; Hwang & Syamsuddin, 2008; Rokhman, 2011; Sabani et al., 2019).

Similarly, according to the results of a Transparency International survey, Indonesia is ranked on the Corruption Perception Index (CPI) in 2013. In 2013, Indonesia was ranked 114th out of 177 countries with an index of 3.2 on the CPI Index (Quah, 2020). This is still far from other ASEAN countries like Singapore (9.2), Brunei (5.2), Malaysia (4.5), and Thailand (3.4), with the added note that Indonesia's public infrastructure and services are still weak.

As a response to the aforementioned condition, in 2003 the Indonesian government issued Presidential Instruction No. 3 of 2003 concerning national policy and strategy for e-government development. This effort showed great results, as proven by the E-government Survey initiated by the United Nations Department of Economics and Social Affairs (UNDESA) in 2012, which found that Indonesia's e-government was ranked 97th, up from 109th in 2010 (Napitupulu & Sensuse, 2014; Sutopo et al., 2017). However, the result seemed in vain when compared to other ASEAN countries, for example Singapore at rank 10, Malaysia at 40, and Brunei at 54. It means the efforts that have been made very slowly to equalize Indonesia with other countries, even within the scope of ASEAN.

Until now, the Indonesian government has focused a lot on implementing the availability of infrastructure, ICT use, and ICT skills. This can be seen from various policies, trainings, and workshops made available for the past two decades (Hermana & Silfianti, 2011; Pudjianto et al., 2011; Wahyuni et al., 2013), giving a sense of a lack of attention in the integration of social aspects of ICT as enabler points of e-government implementation. This is supported by Van Ddikk (2006), who argues that the social aspects are particularly important since they determine the societal acceptances of e-

government implementation due to their determining influences on the society's knowledge, beliefs, and motivation. The social aspects are varied, such as e-leadership, ICT literacy, e-vision, self-efficacy, innovativeness traits, organizational culture, and innovation compatibility, stating that innovation, such as e-government implementation, never occurs in a social vacuum. In other words, social aspects are often less visible, even though they play significant roles in e-government implementation in society. Therefore, it is necessary to know the contribution of each element of e-government and how to develop a model for the contribution of each of these elements.

The main purpose of this research is to build a dynamic model of e-government in accordance with the local conditions of Lampung Province local governments and map the real condition of ICT components including infrastructure, ICT use, ICT skills, and social components such as e-leadership, ICT literacy, e-vision, self-efficacy, the characteristics of innovation organizational culture, and innovation compatibility. This is done due to the vast need for e-government development modeling to build and predict e-government development in the future (Coursey & Norris, 2008; Suki & Ramayah, 2010).

In fact, the dynamic model for e-government development becomes very important because if this model is reliable and can be used as a tool to build e-government development in the environment government in Lampung Province, it will be used by local governments in other provinces. For policy holders, it can be the basis for

development and targeted action plans for strategy revitalization and national level e-government development and become information to prepare a blueprint for national e-government policies in Indonesia.

Method

The problem of e-government is one that needs to be researched, which can be done through descriptive research. This descriptive research aimed at developing a model systematically by referring to the opinion of Forrester (1961), which states that the model is an experiment with a real system. Richardson and Pugh (in Khotimah, 2015) state that dynamic systems are a methodology to understand a complex problem that focuses on policy making and how these policies determine behavior problems that the system can dynamically model.

The data sources for this research are primary data, namely data obtained through observation and interviews, and secondary data, namely supporting data relevant to this research. There are several stages of data collection that can be carried out, which are: (1) Finding and understanding supporting theories that support modeling to improve e-government performance and identifying problems relating to the implementation of the e-government system; (2) Analyze the factors that affect the performance of e-government that will be used for modeling, (3) Create casual loop diagrams, stock loop diagrams, and data input, (4) Verify and validate data, (5) Create and develop a model scenario, and (6) Analyze results and create models.

Data analysis was carried out through the stages of information

collection, data reduction, presentation of data, verification, and drawing of conclusions. The modeling procedure is:
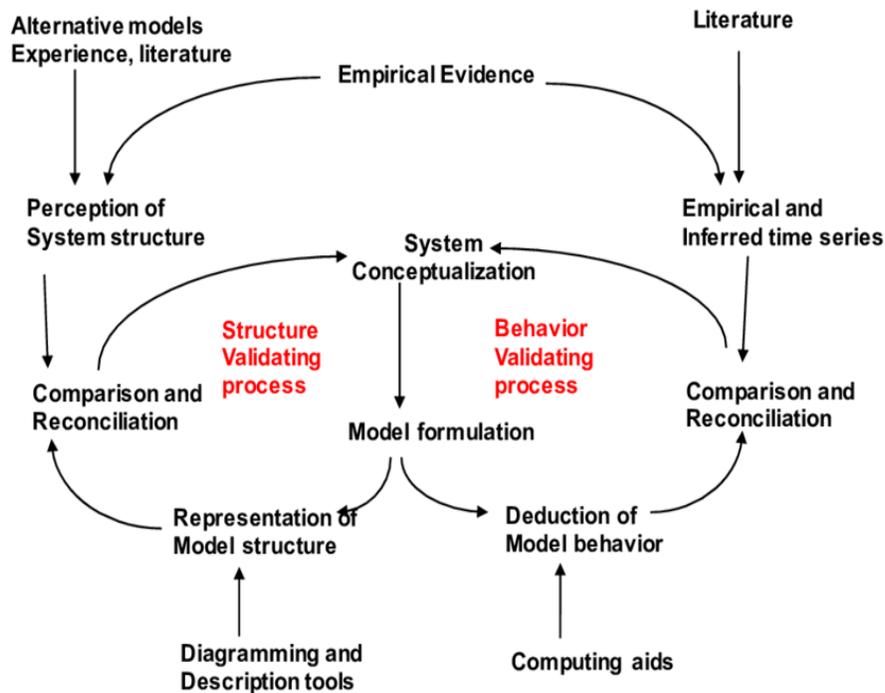
Source: Avianto (2010)
Figure 1. System Dynamic Modelling Procedure

Result and Discussion

Referring to the results of observations and secondary data findings, it is found that there are five main variables that support e-government performance and will be considered in developing the dynamic model. They are (1) e-government, (2) service, (3) performance, (4) society/user, and (5) quality of people's lives. This research discovers that the five variables are constructed based on each variable's input-output supporting elements. In addition, the research also uncovers interrelated relationships between variables. The research results will be further elaborated as follows:

Variable-1: E-Government

The implementation of e-government has become a key factor in the pursuit of good governance and the delivery of public services that are effective, efficient, and transparent. As a variable in the dynamic model, e-government reflects the continuous evolution of government structures and processes in response to the growing demands of citizens and the increasing complexity of the global environment. The implementation of e-government is

complex and requires the involvement of various factors. The input-output supporting factors on the e-government variable include policies, human resources, infrastructure, and management.

E-government policies that are effective are crucial for the successful implementation of e-government. The development of policies that support e-government is crucial to ensuring its effectiveness. The input supporting factors of e-government in Indonesia are supported by several legislative regulations, as follows: the e-government conceptual framework, the e-government blueprint, the e-government roadmap, and the government implementation plan. The e-government implementation plan for both central and local government agencies remains within the framework and is part of the national e-government implementation. The development of e-government is also enshrined in the 1945 Constitution, Article 28f, which states: "Every person has the right to communicate and obtain information to develop themselves and their social environment, and has the right to seek, obtain, possess, store, process, and convey information using all available channels." It is found that several provinces and cities in Indonesia have their own e-government systems that differ from other regions. The basis for the implementation of e-government at the local level refers to several regulations, such as Law Number 22 of 1999 concerning regional government, Law Number 25 of 1999 concerning the balance of finance between the central government and regional governments, Law Number 36 of 1999 concerning telecommunications, and

Government Regulation Number 25 of 2000 concerning the authority of provinces as autonomous regions.

E-government human resources support the successful implementation and operation of e-government initiatives. E-government human resources encompass the skills, knowledge, and expertise required to plan, design, implement, and maintain e-government systems and services. In this context, the role of human resources in e-government has been acknowledged as critical to ensuring the effectiveness, efficiency, and sustainability of e-government initiatives. It is found that there are two input factors that influence an organization: (a) internal factors, which encompass the overall life of the organization and can be controlled by both leaders and members of the organization, and (b) external factors, which include the influence of the environment in which the organization operates.

E-government infrastructure refers to the technological and physical components that enable the delivery of electronic government services to citizens and businesses. In today's digital age, e-government infrastructure has become an essential component for governments worldwide to improve their service delivery and enhance their public administration systems. E-government infrastructure includes hardware, software, networks, databases, and other related technologies, such as cloud computing and big data analytics. The research finds that e-government infrastructures are related to human resources (such as the general public, operators, leaders, government officials, and operators), hardware (which consists

of data entry equipment, data presentation equipment, data storage equipment, and data processing equipment), and software (input/output, data storage, process management, and communication).

Finally, e-government management is essential for ensuring the success of e-government implementation. Effective management of e-government systems will ensure the delivery of quality services to the public. The research finds that human resources management, hardware and software, an integrated information system, and intellectual property rights all play a role.

While for the output, supporting factors for e-government in Indonesia are related to the provision of services and technology adoption. It means that the implementation of e-government is closely related to providing services to the public through technology adoption. This indicates that the quality of technology adoption is also related to the quality of services.

Variable-2: Service

One of the most critical factors in the success of e-government initiatives is the quality of the services offered. While the use of technology can streamline processes and reduce costs, if the services provided do not meet the needs of citizens, the initiative will not be successful. In other words, the service itself is the determining factor of e-government. This research finds that the input components of the service variable include e-government, management, technology resources, technology adoption, and motivation.

E-government service means the use of information technology by the government to provide information and services to its citizens, business affairs and other matters related to governance. E-government can be applied to the legislative, judiciary, or public administration sectors to improve internal efficiency, provide public services, or facilitate democratic governance processes. The main delivery models are Government-to-Citizen or Government-to-Customer (G2C), Government-to-Business (G2B), and Government-to-Government (G2G). The most anticipated benefits of e-government are improved efficiency, convenience, and accessibility to public services. The purpose of establishing e-government is the establishment of networks and public service transactions that are not limited by time and location and are available at a cost accessible to the public.

Service management as an input factor to e-government services is closely related to service management, which includes planning, organizing, implementing, and controlling the services to be provided. This service is highly dependent on the implementation of e-government in the determined sector.

Service technological resources discuss how technological sophistication has been utilized through e-government implementation, especially the internet. This online system is expected to improve relations between the government and other parties. In other words, this is considered important because almost every citizen will deal with government agencies for various administrative needs, business licensing, and so on. Technology enables online delivery and management of facility data. We can send all form and file requirements from anywhere with

ease. The data will then also be processed faster, so the community will not have to wait a long time for documents or an exit permit. This online system is also one of the solutions to prevent corrupt practices. It is hoped that by doing so, the level of transparency will be increased because all government documents, such as public budgets and government programs, as well as policies that will be and have been made, will be available to anyone and at any time.As a result, the relationship between the government and the public becomes better because there is no longer any distrust or suspicion of the government.

Two final input factors in the service variable are adoption of technology and motivation. The research results show that technology adoption is crucial for the success of e-government initiatives as it directly impacts the level of user acceptance and utilization of digital services. When citizens adopt new technologies, they become more comfortable using digital platforms and services, which leads to higher usage rates and satisfaction levels. This, in turn, results in better public service delivery and improved citizen engagement.

Furthermore, technology adoption by government agencies and officials enables them to operate more efficiently and effectively, reducing the administrative burden and enabling them to provide better services to citizens. Adopting new technologies can also help to streamline communication channels, automate processes, and reduce costs, making it easier for governments to deliver high-quality services to citizens.

In addition to that, the research results show that motivation is an important factor in supporting e-government initiatives as it influences the level of engagement and participation from citizens and government officials. Motivation is defined as the internal and external factors that drive individuals to take action towards achieving their goals. In the context of e-government, motivation can be seen as the factors that encourage citizens and government officials to utilize digital platforms and services.

Finally, the output component of the variable service is performance, which means that service quality is related to performance. Good service will indicate good performance, and vice versa.

Variable-3: Performance

Performance is an important output variable in e-government as it reflects the quality of service provided to citizens and the effectiveness of government operations. Measuring performance can help governments track their progress, identify areas for improvement, increase accountability and transparency, and make data-driven decisions, all of which are critical for the success of e-government initiatives. The input components on the performance variable include service, management, technology adoption, and motivation.

Service as a performance input in its implementation can be seen in the various types of services offered by the government to society through e-government. The research finds that these types of services are evaluated by looking at them from two main aspects: the complexity aspect, which concerns how complicated the applications and e-government are to build and implement, and the benefit aspect, which concerns

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matters related to the magnitude of the perceived benefits by their users.

Management as a performance input is closely related to the planning and implementation of various aspects that affect the implementation of e-government. While adoption of technology as a performance input is closely related to HR capabilities in operating e-government applications. The adoption of this technology also has a relationship with various aspects that exist in HR that can influence competence in adopting technology. Next, motivation as a performance input is highly affected by performance. The research result shows that good human resource motivation will affect performance. Human resources involved in the operationalization of e-government should have motivation to progress, not only for the development of their own quality and competencies, but also to have motivation to work together with users and the community to be able to adapt and improve the implementation of e-government.

The output component of the performance variable includes the community. The community is the main target of the implementation of e-government. Since the community is too vast, the easiest way to socialize everything related to the government is through electronic media, which has a wider range and is more cost-effective.

Variable-4: User

The success of e-government is highly dependent on the satisfaction and trust of the users towards the services provided. The feedback and input from users can also help improve the quality of services and ensure that they meet the needs and expectations of the community. In addition, involving users in the design and implementation of e-government can promote transparency, accountability, and democratic participation in governance. The research result shows that the input components for the community/user variable include performance, policy, literacy, motivation, technology adoption, rate and speed of innovation, demographic and sociocultural aspects, level of education, and economic level.

Performance as the user's input variable is based on the roots of 4 principles. First principles related to the focus on service improvement that government provides to society. The second principle is the construction of a competitive environment. The third principle is to reward innovation, and the fourth principle is to emphasize effort on achievement efficiency.

Policy as the user's input variable determines the community as part of the government system that is bound and governed by a variety of rules, including policies that are set by the government. Policy on e-government is regulated by the government with the aim that the implementation of e-government can take place well. While literacy is the user's input variable, it is related to the mastery of an important skill, namely information skills. The research finds that some literacy skills that can support information literacy include library literacy, visual literacy, media literacy, computer literacy, and network literacy.

Motivation as the user's input variable has two important roots. First, the changes that are being experienced by users provide opportunities for the arrangement of various aspects of the life

of the nation and state so that the interests of the people can be put back in the center. Second is the arrangement of various aspects of national life and statehood that occurs in the environment between people in an increasingly open nation, where values that are universal in the fields of economy and trade, politics, humanity, and the preservation of environmental functions are complexly interrelated.

Adoption of technology as a user's input variable encompasses aspects of demography, psychological interest, and motivation. While innovation speed as a user input variable concerns existing communication technology that has changed the previous dominant communication paradigm. The development of communication technology expands opportunities for two-way communication, namely between the community and the government and vice versa. This is where there is a change or transformation in the government's working mechanism, which is now oriented towards information management and communication strategy.

Aspects of demography as input for a user variable are all about e-government relating to the area or geography in it. In the demographic aspect, this is the root of the existing infrastructure that has divided e-government into three parts, namely the existence of digital inequality, the availability of infrastructure for information procurement and communication technology, which is still centralized in big cities, and the abstinence of a standardized public service system in Indonesia. While social culture and education level are encountered as inputs for user variables in the implementation of an e-government system to improve

governance government. The main problem is resistance and indecision when responding to new innovations to break old habits.

Variable-5: Quality Of People's Life

The quality of people's lives can have a significant impact on e-governance, which is the use of technology to provide government services and engage with citizens.

Components of input on the variable of people's quality of life include community, demographic, sociocultural aspects, level of education, economic level, technology diffusion, e-literacy, and conditions of global society.

Society as an input variable of quality of life correlates to the positive impact of implementing an e-government system in Indonesia. In a society that can receive performance reports from the government in an actual and transparent manner, the people can freely access information about government performance. Demographic aspects as input variables for quality of life discussion on demographic aspects is all about e-government relating to the area or geography in it. Social culture as an input variable for quality of life is attached to the community. Socio-cultural aspects can be used as an asset in development. The adaptation rate in society towards technology and new things is very much colored by the dynamics of socio-cultural life in Indonesia.

Education level as an input variable of quality of life covers impact on quality of life in e-governance. Governments can improve the quality of e-governance services by ensuring that they are accessible and user-friendly to people with

varying levels of education. Additionally, e-governance services can be designed to provide access to job opportunities, training programs, or other resources that can help people improve their economic opportunities and overall quality of life.

Diffusion of technology and e-literacy as input variables for quality of life examine the spread or enlargement of technology, from one party to another, while e-literacy can be defined as an important input variable that can impact the quality of life in e-governance. Governments can improve the quality of e-governance services by ensuring that they are accessible and user-friendly to people with varying levels of e-literacy. Additionally, e-governance services can be designed to provide access to training programs, funding opportunities, or other resources that can help people improve their digital skills and overall quality of life. Lastly, the condition of global society serves as an input variable for quality of life. The research result shows that this element can have a significant impact on the local development of e-governance. Governments need to be aware of global trends, standards, and best practices to ensure that their e-governance services are relevant and effective. Additionally, governments may need to collaborate with international organizations to develop joint e-governance projects or share data and information.

Interrelated Components of E-government Implementation and Performance Models

The research result shows that several variables have a direct influence on the reciprocal correlation, as explained below. First, the human resources and infrastructure. These two variables are inseparable based on three considerations: the existence of digital inequality, the availability of infrastructure for information technology procurement, and the unstandardized public service system in Indonesia. Second, the human resources with policies are not evenly distributed due to the conflict of interest at the central government level and area, regulations that have not been socialized and implemented, as well as budget allocation for infrastructure development and public service, which have not utilized the e-government system in the APBN and APBD as a priority. Third, users with an economic level. The research results reveal that a society with an economic level is a unity that cannot be separated unconsciously from e-government. Because the economic level can be used as a benchmark for success in society. Lastly, the internet penetration is due to technology diffusion. The penetration of society with the diffusion of technology is a unity that cannot be separated unconsciously from e-government. Because of its penetration, the internet will be able to support the diffusion of technology.

Construction of Dynamic Structural Model of E-Government Development.

Referring to the explanation from the previous sub-chapter about the components and the contribution of each component, the model between variables and sub-variables can be seen as follows:

Figure 2. Structural Model of E-Government Performance

Implication of System Dynamic Models for Improving E-Governments Performance Local Governments in Lampung Province

In Lampung Province, the implementation of SDM could have significant implications for the performance of local governments. Here are some potential implications of using SDM for improving e-governance performance in Lampung Province:

Better Policy Development

The System Dynamic Models (SDM) can be particularly helpful in developing effective policies and strategies for e-

governance in Lampung Province. The SDM approach can be used to create simulations that replicate the complex interactions between different factors affecting e-governance performance. The model can then be used to test different policies and strategies to see how they impact e-governance performance.

For example, if the local government wants to improve citizen engagement with e-governance services, they can develop a simulation that includes factors such as the availability of internet access, the usability of e-governance websites, and the level of

awareness and trust in e-governance services. By changing different variables in the simulation, such as increasing internet access or improving the usability of e-government websites, the model can simulate how these changes might impact citizen engagement with e-government services.

Through this approach, local governments in Lampung Province can develop more effective policies and strategies that are based on evidence and data-driven analysis. The use of SDM can also help identify potential unintended consequences of policies or strategies, allowing local governments to adjust their approach before implementing changes.

Overall, the use of SDM in Lampung Province can help local governments develop more effective policies and strategies for e-governance. By using data-driven simulations to test different scenarios, local governments can make more informed decisions and better serve the needs of their citizens.

Enhanced Collaboration

SDM can also help improve collaboration between different departments or agencies involved in e-governance in Lampung Province. This is because the models can provide a visual representation of the complex relationships and feedback loops between different factors affecting e-governance performance. By using SDM, local governments can break down silos and promote cross-functional collaboration.

For example, if a simulation shows that a lack of internet access is hindering citizen engagement with e-governance services, multiple departments may need to work together to address the issue. The department responsible for internet infrastructure may need to collaborate with the department responsible for e-governance services to ensure that the websites are optimized for low-bandwidth connections. Similarly, the department responsible for citizen outreach may need to work with the department responsible for e-governance services to ensure that citizens are aware of the available services.

Through this approach, SDM can help local governments in Lampung Province identify areas where cross-functional collaboration is needed to improve e-governance performance. By breaking down silos and promoting collaboration between different departments, local governments can ensure that e-governance services are delivered in a more integrated and holistic manner.

Overall, the use of SDM can help local governments in Lampung Province promote collaboration and break down silos between different departments involved in e-governance. By providing a visual representation of complex relationships and feedback loops, SDM can help ensure that e-governance services are delivered in an integrated and holistic manner.

Increased Transparency and Accountability

The use of SDM in Lampung Province can increase transparency and accountability in e-governance. This is because SDM can provide a clear visual representation of how different factors impact e-government performance. The model can be used to explain policy decisions and actions taken by

government agencies to the public, increasing transparency and accountability.

For example, if a simulation shows that a particular policy decision will result in lower citizen engagement with e-governance services, the government agency responsible for making that decision can use the model to explain the reasons for the decision to the public. This can help build trust and understanding between government agencies and citizens, ultimately leading to more effective e-governance services.

Through this approach, the use of SDM can help local governments in Lampung Province increase transparency and accountability in e-governance. By providing a visual representation of how different factors impact e-governance performance, local governments can explain their decisions and actions to the public, increasing trust and understanding between government agencies and citizens.

Overall, the use of SDM can help local governments in Lampung Province increase transparency and accountability in e-governance. By providing a visual representation of how different factors impact e-governance performance, local governments can explain their decisions and actions to the public, increasing trust and understanding between government agencies and citizens.

Improved Resource Allocation

The use of SDM in Lampung Province can also help local governments more effectively allocate resources for e-governance. This is because the models can be used to identify areas where investment in e-governance

infrastructure, such as internet connectivity or citizen outreach programs, can have the greatest impact on improving e-governance performance.

For example, if a simulation shows that a lack of internet connectivity is hindering citizen engagement with e-governance services, local governments can use this information to prioritize investment in internet infrastructure in the areas where it will have the greatest impact. This targeted investment can help ensure that resources are used in the most effective and efficient manner, ultimately leading to improved e-governance performance.

Through this approach, the use of SDM can help local governments in Lampung Province more effectively allocate resources for e-governance. By identifying areas where investment can have the greatest impact, local governments can ensure that resources are used in the most effective and efficient manner, ultimately leading to improved e-governance performance.

Overall, the use of SDM can be a powerful tool for local governments in Lampung Province to identify areas where investment in e-governance infrastructure can have the greatest impact. By ensuring that resources are used in the most effective and efficient manner, local governments can provide better e-governance services that better serve the needs of their citizens.

Long-term Planning

The use of SDM in Lampung Province can also help local governments anticipate and prepare for future challenges to e-government performance. By developing simulations that take into

account various possible scenarios, local governments can identify potential risks and challenges that may arise in the future and develop strategies to mitigate them.

For example, if a simulation shows that increasing demand for e-governance services will strain existing infrastructure and resources, local governments can use this information to proactively develop plans to expand infrastructure and allocate resources in advance of the increased demand. By preparing for future challenges in advance, local governments can ensure that they are able to provide uninterrupted and effective e-governance services to their citizens.

Through this approach, the use of SDM can help local governments in Lampung Province better anticipate and prepare for future challenges to e-governance performance. By identifying potential risks and challenges and developing strategies to mitigate them, local governments can ensure that they are able to provide effective and uninterrupted e-governance services to their citizens.

Overall, the use of SDM can be a powerful tool for local governments in Lampung Province to anticipate and prepare for future challenges to e-governance performance. By developing simulations that take into account various possible scenarios, local governments can identify potential risks and challenges and develop strategies to mitigate them, ultimately leading to more effective and uninterrupted e-governance services.

Conclusion

In conclusion, the use of System Dynamic Models (SDM) can have significant implications for improving e-

governance performance in Lampung Province. The use of SDM can help local governments develop evidence-based policies and strategies that are informed by data-driven analysis. Additionally, SDM can promote cross-functional collaboration between different departments or agencies involved in e-governance and increase transparency and accountability in e-governance.

By using SDM to develop simulations that replicate the complex interactions between different factors affecting e-governance performance, local governments in Lampung Province can make more informed decisions and better serve the needs of their citizens. The use of SDM can also help identify potential unintended consequences of policies or strategies, allowing local governments to adjust their approach before implementing changes.

Acknowledgment

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