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Understanding Smart Environment Strategy in Developing Countries Cities

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ABSTRACT

A smart environment is a necessity in many modern cities when information technology becomes the choice of communication and interaction. The purpose of this research is to formulate a proposed strategy that is measurable and easy to operate in implementing a smart environment in cities in developing countries. We use a competitive intelligence approach to build a smart environment strategy. The results of this study, we formulate a smart environment strategy in cities whose countries are developing based on the smart city model in one of its dimensions, namely the smart environment dimension. We formulate Strategic Alignment by making a mapping based on the mission and goals of city leaders to the dimensions of the smart environment. We also conducted a gap analysis using SWOT analysis and developed a smart city implementation strategy with 4 categories, namely strategic, key operational, high potential, and support.

Keywords: *competitive intelligence, cities, smartcity, smart environment, strategy implementation*

INTRODUCTION

Smart Environment is one of the pillars/dimensions in building a smart city. In a smart city, the smart environment is used as an effort so that local governments are able to manage the quality of the environment in a quality manner. A quality smart environment can improve the quality of

life, provide comfort, physical and non-physical beauty, for the city community and the public(Mishra et al., 2020)(Direktorat Pengembangan Kawasan Pemukiman, n.d.). Basically, the development of a city must be based on "building with nature" if, without a sustainable and smart environment, it will be difficult to achieve regional prosperity and the welfare of city residents. Many governments in developing cities have developed legislation relating to spatial planning, which requires 30% of urban land to be used as private and public green open spaces. Smart Environment makes information technology elements a driving force to realize development, such as IT-based environmental management, IT-based natural resource management (Addison et al., 2019) , development of renewable energy sources (Purnomo et al., 2018) (Hoang et al., 2021).

Increasing urbanization in developing cities gives rise to environmental problems that are at risk of increasing air pollution, waste, disasters, health (A & B, 2021) (Mark J. Nieuwenhuijsen, 2021), decreased quality of life and climate change (Voukkali & Zorpas, 2021). Residents in smart cities are increasingly modern because they use various information technology applications that have an impact on improving quality of life standards. They have a myriad of expectations such as a comfortable living and working environment, ease of managing all forms of public services, and the existence of an adequate public area. So far, the implementation of smart environments in cities in developing countries is still facing obstacles because they have not been able to provide broad smart environment services to the community, require high speed and accuracy, and are supported by adequate human resources managers in charge of running the system. This is also due to the lack of information technology infrastructure so that it becomes difficult to fulfill. The city government is also still lacking in terms of funding, this is where there are many problems that make it difficult to implement the smart environment optimally.

To overcome this problem, in this study several solutions have been built, namely finding various machine learning methods that solve data difficulties in smart cities, this has potential and challenges, especially the role of machine learning technology(Ullah et al., 2020) for Internet of Things (IoT) and Big Data Analytics(Ranjan & Foropon, 2021), various applications and computer applications, artificial intelligence, wireless networking, sensor technology, and other technologies related to environmental and human management (Ahad et al., 2020)(Jamil et al., 2015). Environmental protection in recent years has become a smarter and more connected system for all aspects of global cities. By using the smart environment concept, you can create environmentally friendly houses and buildings and use renewable energy sources (Hoang et al., 2021). Climate resilience planning (Koy & Rodrigues, 2019). Building a framework for alignment with infrastructure assets that have been built (Heaton & Parlikad, 2019). It takes a good commitment from the city government as a policymaker and the community as involved parties to work together to create a smart environment. Due to budget constraints to start formulating the best way, organizers are still having difficulty implementing a smart environment. Therefore, a design is urgently needed to balance the components of the smart environment and the existing budget in determining the concept of a smart environment that can be implemented easily according to the capacity of the existing resources in the city. This is what drives the importance of making a smart environment implementation strategy that is appropriate and can be operated easily according to existing resources.

Therefore, this study is very important to formulate a smart environment implementation strategy. The aim of this research is to formulate a strategy that is measurable and easy to operate in implementing a smart environment in a smart city so that it is easy to implement.

METHOD

This research was conducted by following a competitive intelligence approach which guided this research to be directed and have a clear path. This approach is an approach that can produce an appropriate strategy and can be implemented easily. This method has been used by Tulungen (Franky et al., 2021), namely the competitive intelligence approach in analyzing and formulating strategies. This is the competitive intelligence cycle method.

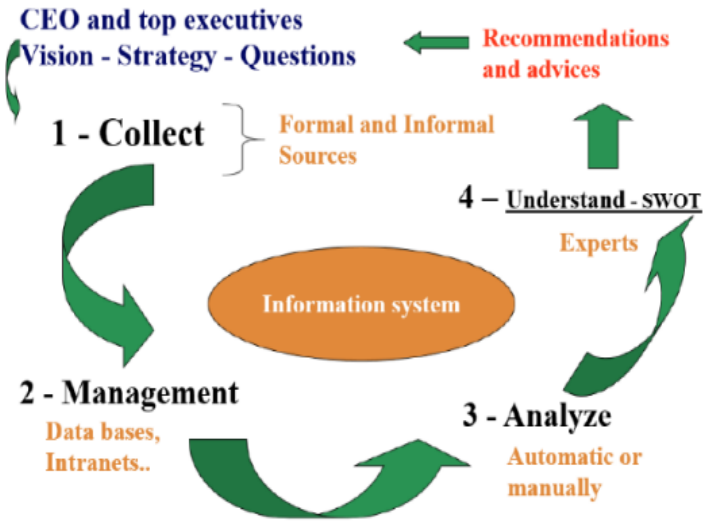

Figure 1. *Competitive intelligence cycle* (source: (Franky et al., 2021))

The competitive intelligence approach is the approach we use, this approach has four steps as follows:

a) Collect

In this step, what we do is collect information through surveys, interviews and documentation assessment. We conducted a survey by distributing questionnaires to 48 city government agencies that manage smart environments, 20 communities, 50 industries and 10 academics. We also conducted interviews with the person in charge or the head of the agency and the operator managing the smart environment. Meanwhile, the documentation, study that we carried out was to collect reports on the evaluation results of smart environment organizers containing evaluation results and recommendations for smart environments that have been running in the smart cities.

We used a sample in the city of Tomohon, North Sulawesi province, Indonesia. Since 2017, the city has implemented a smart city and is still running with limited conditions.

b) Management

In this second step we do data management of the information we have collected, this is also filtered according to the purpose and we store it with knowledge management so that it can be extracted for analysis. The results of the existing surveys, we recapitulate the data and present them in the form of graphs and data to make it easier for us to do the analysis.

c) Analyze

The third step we took was an analysis of the data that we had previously collected. The analysis we carried out comprehensively to formulate strategy mapping and gap analysis.

d) Understand

In this fourth step, what we do is formulating an implementation strategy based on the results of the previous analysis. We formulate the strategy using the McFarland Strategic Grid analysis model. Based on four categories, namely STRATEGIC, KEY OPERATIONAL, HIGH POTENTIAL, and SUPPORT, we make an implementation strategy.

RESULTS AND DISCUSSION

Model smart environment

There are many smart city models and their dimensions as suggested by several previous researchers such as Prince (Antwi-Afari et al., 2021), Lom (Lom & Pribyl, 2021), Secinaro (Secinaro et al., 2021) dan Westraadt (Westraadt & Calitz, 2020). We use the smart city model, which is widely used in developing countries, especially Indonesia. The smart city model has six dimensions, one of which is the dimension number six, namely the smart environment used in cities in developing countries. See figure 2.

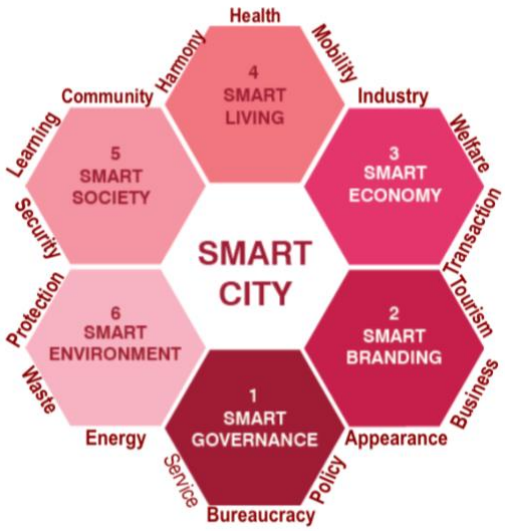

Figure 2. Six-dimensional smart city model
(source: (Anityasari, 2019)(P.K.D Indonesia, 2018))

In the smart environment model, it has become a model set by the Indonesian government as a model that must be followed in accordance with government policies(Anityasari, 2019). Smart environment is the ability of local governments to realize good(Shamsuzzoha et al., 2021), responsible, and sustainable environmental governance (Liu & Zhang, 2021) (Khan et al., 2017). Smart Environment consists of protection, waste, and energy.

Strategic Alignment

For the implementation of smart environments in smart cities in developing countries, we conduct mapping to choose the right strategy. Our mapping is done by aligning the mission of regional leaders / city leaders with the goals, objectives and components of the smart environment. The mission, goals and objectives are mapped according to the dimensions of the smart city for the smart environment that have been discussed previously. The results can be seen in table 1.

Table 1. Mapping of Smart Environment Goals, Goals and Components

Mission	Goal	Target	Smart City Component
Advancing the Agricultural System in order to realize food sovereignty.	The realization of increased production of agricultural commodities to realize food sovereignty	Increased food security	Smart Environment

Gap Analysis

As a basis for formulating an implementable strategy, we have carried out an analysis to find a gab as a basis for formulation. We conduct an analysis by looking at the internal and external conditions of the city. We analyze the strengths and weaknesses on internal conditions, while external conditions analyze on Opportunities and Threats.

We performed a SWOT (Strength, Weakness, Opportunities, Threats) analysis. Various strengths that can be maximized, we find to achieve goals and realize the mission of the city. See table 2. Some of the strengths that can be optimized are the commitment of city leaders who can motivate all regional apparatus and apparatus so that they can work optimally with the community as involved parties. In addition, there is a smart city council for the smart environment dimension which is a leadership panel in charge of formulating and initiating various ideas from one of the dimensions, namely the smart environment that can be implemented in the smart cities. This board consists of various stakeholders such as experts and academics, community, community and industry leaders. They can collaborate in formulating various smart environment ideas and programs.

In addition, we also analyze internal conditions on the weak side. Its purpose is to reduce weaknesses with various programs and reduce the negative impacts that may occur later. There are several weaknesses that must be anticipated, namely the lack of staff in the IT field who have good competence in managing technology infrastructure and various applications/software that will be run in a smart environment in a smart city. In addition, there are also services that have not been integrated into a weakness that must be found solutions to integrate various applications that are run by maximizing the technology APIs installed in these applications. Thus, users and service users are facilitated by using a single sign on with one username in various applications. The data integration is a weakness that must be overcome so that the speed and accuracy of the service can be guaranteed.

We also conduct an analysis of external conditions, namely Opportunities, this analysis is useful for viewing and inventorying various opportunities that can be utilized to obtain great benefits. Some of the opportunities that were successfully noted, were the existence of various collaborations with various stakeholders. This opportunity can also take the form of investment interest, economic growth, increased welfare, generation change, central government support, community participation, potential contribution from the business sector. This condition can provide a great opportunity for the city government to maximize cooperation with industry and business actors in the production of goods and services, the community in interacting and utilizing

services, universities in strengthening research and innovation, the media as part of communication between various components of the city both from government, society and industry, as well as the government as regulator and policy maker.

The part in the last analysis is Threats. This section is important to anticipate in the future. In this condition, an appropriate strategy must be formulated to reduce the level of risk that arises and anticipate it so that it does not cause large losses and negative impacts. One of the existing threats is the COVID-19 pandemic, which has a huge impact on various sectors such as health, economy and tourism, which need to be handled carefully and appropriately so as to reduce the negative impacts and losses that occur. Potential threats also include climate change, natural disasters, social unrest in the community, disruption of public order and conflicts between communities. In addition, other threats, such as radicalism, need to be anticipated, so that later they do not cause terror and casualties, thereby creating fear and public distrust of the government. This of course will have an impact on the confidence of investors who invest in various sectors.

The results of the SWOT analysis of the smart city on the dimensions of the smart environment. See table 2.

Table 2. SWOT *Smart Environment*

SWOT SMART ENVIRONMENT			
- The topography of the outskirts of the city consisting of hills and lakes that can be a tourism potential - A comprehensive environmental management policy with the implementation of environment-based development	- Development of settlements that take agricultural land and forest areas into residential areas - Heavy rainfall makes it prone to floods and landslides - Inadequate waste management infrastructure results in waste not being managed properly	- Improved waste treatment technology so that it can be used as an alternative energy source - Ground water that is still maintained so that it can provide an adequate supply of clean water - Utilization of alternative energy from natural gas, water, wind and sun which is still abundant	- Cities are included in disaster-prone areas, with volcanoes - As a transit capital, the City experiences dynamic and very diverse population migration, which can lead to social conflicts

Priority Analysis

After we did a gab analysis using SWOT analysis tools, we continued to formulate strategies using McFarland Strategic Grid analysis. We use this analysis because it is very appropriate to formulate the priorities of the strategic options that have been formulated. Through this priority analysis, each initiation can determine the priority strategy for the smart city that will be implemented. In order to formulate the order of priority we label the following:

- STRATEGIC(S). The Strategic label means that this initiation is very important to do because it is related to the services to be prepared by the government which are very much needed right now.
- KEY OPERATIONAL (K). This Key operational label views the initiation as important but not urgent. Will be very much needed in the future.

- HIGH POTENTIAL (H). The High potential label is given to important initiatives but still far from being implemented.
- SUPPORT (U). This Support label is given to initiations that are not very important for service but are quite helpful if done.

We determine the priority according to the four labels. The following is a Priority Analysis using the McFarland Strategic Grid analysis, we categorize it according to the dimensions of the smart environment in a smart city. The priority strategies formulated in the smart environment dimension are shown in table 3. The formulation of strategies that are the main and strategic priorities, such as improving drinking water infrastructure networks. The key operational strategies are the use of systems in separating organic and non-organic waste, making SMS flash systems related to disasters in collaboration with Providers and BMG and installing sensors needed in the City environment. (Jamil et al., 2015). While the strategy that is high potential is the implementation of education related to the waste management and grouping system in schools. A supportive strategy that needs to be implemented is the socialization of disaster SOPs at every government and school event.

Table 3. Dimension priority analysis
SMART ENVIRONMENT

No	Initiations	Priority
1	Installation of sensors required in the city environment	**K**
2	Improvement of drinking water infrastructure network	**S**
3	The use of the system in separating organic and non-organic waste	**K**
4	Creating an SMS blast system related to disasters in collaboration with Providers and BMG	**K**
5	Dissemination of disaster SOPs at every government and school event.	**U**
6	Implementation of education related to waste management and grouping systems in schools	**H**

There are various factors that must be considered in formulating a smart city strategy on the dimensions of the smart environment so that it can be successfully implemented in cities such as information technology infrastructure factors(Heaton & Parlikad, 2019), used as sensors and integrated with various systems that run in smart environments including energy (Zhang et al., 2021) (Jararweh et al., 2020), Smart environment development requires the right policiest (Masik et al., 2021) , and the formulation of strategies that are in line with the vision and mission of the regional head who is the leader of the city. This will encourage synergy in the implementation of programs that are more tangible and measurable according to the previous design. The existence of budget support is an important factor as an instrument in smart environment financing. The limited budget conditions due to the low economic level of cities in developing countries forced various ways to absorb the limited budget. Sometimes this causes obstacles for the decline in the quality of

infrastructure and implementation of smart environment applications so that it only produces low output and does not have a broad impact on the community (Sharifi, 2020) (Koca et al., 2021).

The formulation of the right strategy for cities in developing countries must be in accordance with the uniqueness and potential of each city. This will be the strategy in each city is different from one another. Each city has characteristics that other cities do not have and also have different characteristics, including the potential and resources of that city. This is what causes the formulation of a smart environment strategy cannot be replicated in other cities. It is very important to pay attention to human resources, both staff and operators who will operate various systems installed in the smart environment, service users, both communities, business actors and industry (Wang et al., 2021) and the general public who use smart environment services. Staff and operators must have sufficient competence to run a smart city system starting from maintaining information technology infrastructure, operating various applications and the ability to be able to repair the damage that occurs. The general public as service users must have good skills and knowledge in using various digital-based services that have been provided by the city government. It is very important to formulate an appropriate strategy to consider various existing and complex factors to produce the right smart environment implementation strategy and have good outcomes for the city and all stakeholders.

CONCLUSION

This study concludes that the smart environment implementation strategy has been successfully carried out by mapping out alignment strategies, gap analysis, and formulating strategies based on implementation priorities. We have used Alignment Analysis to map the mission and goals of smart environment organizers so that it is easier to analyze and formulate strategies. We have developed a smart environment implementation strategy using gab analysis on one of the dimensions of a smart city, namely the smart environment, and we have succeeded in formulating an implementation strategy using the McFarland Strategic Grid analysis model to determine priority programs to be implemented. This result is expected to be able to build a smart environment master plan document that becomes a guide in developing smart environments in cities in developing countries.

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