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Understanding the Acceptance of Local Public Officers on Computer-based Urban Spatial Information System

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ABSTRACT

Information technology is developed to assist people in minimizing processing time, reducing errors, increasing the accuracy and simplifying the overall process. The process of recording, retrieving and displaying data and information can thus be easily and accurately undertaken. Information technology in its initial development, however, tends to be too costly and complicated to make a real particularly for people in developing countries. Fortunately, universities as the centers of innovation, can be a game changer for the adoption of the innovative processes, for the benefits of the community at large. In all Indonesian universities, this role is associated with a, so called *Tri Dharma Perguruan Tinggi* (Three Devotions of Higher Education, TDHE). This paper examines the acceptance of the collaborating officials and the obstacles i.e. internal and environmental factors. We proposed the use of GIS-based technology to coordinate the administrative units of local government at all levels, particularly the *Kelurahan* as the lowest hierarchy of the administrative unit in local government system. The *Kelurahan* will then be the spearhead in a local government system in Indonesia in promoting administrative services to all Citizens. We undertook an integrated training and tutorial for select official staff of the *Kelurahan* on the system. Evaluation of shows that the information system can be used to simplify the collaborators' activities. The evaluation was done through in -depth interview to the collaborating officials. The collaborators interested in learning more about the system as an innovative way in providing service to the community as well as spatial data input to support urban planning and management.

1. Introduction

1.1 *Spatial Information System for Local Government in Data Collection*

Along with the history of human advancements, technology plays significant roles in the dynamic and ever changing life (Mincer, 1991). The human civilization have been going along with the technology. Human-beings have been supported and entertained by the technology. A very visually clear and easily found example, technological inventions from handheld axes to smartphones have helped human-beings in simplifying their tasks, progressing their accessibility, increasing productivities and advancing life, particularly in the era of this advancing mobile phone (Park and Lee, 2012). Indeed, the advance technology is the answer of almost human needs for simplifying tasks and saving times (Kamibeppu and Sugiura, 2005), as well as generating the negative sides of smartphone as a product of technology such as addiction (Park and Park, 2014), health problems (Thomee et al., 2011). Technology is deemed useful if only we can utilize, apply and implement in everyday life. For example, for the jobs, in social life, or just merely for fun. To be fully implemented and utilized, the technology must be properly introduced to their potential users to gain their interests. By this notion, the advance of technology must be kept adapting and utilizing. Technological advancement is basically the innovation by people towards the increasing productivity and progressing life. It may need expensive inputs and continuous investments in human capacity and knowledge (Hughes, 2014). Ramey (2012) also argued that technological advancements have also helped businesses and organizations save time and cost of production, which has been an advantage to all businesses. They manage these advancements to gain competitive advantage. A good a example is the 3G/4G broadband, small businesses have taken advantage of this super fast internet to reach target markets with less costs of operation.

In the developing cities, universities and other research institutions are one of the change agents, and they can play their essential roles as the main front-ends of technological innovations and applications to support local government in organizing and managing good urban governance towards the accomplishment of their mission. These research institutions can be independent or commercial research institutions, research institutions those associated to technological

manufacturing companies, or research institutions in the universities, meanwhile, a research university, which is a university with the main role of research, is yet to establish in Indonesia by the authority. A research institution in a university is therefore an important university's wing and is a manifestation of research services as one of the TDHE functions of universities. An innovation delivered by a research institution is a manifestation of knowledge advancements that have been accumulated and bred in universities along with their learning process. The technological innovation produced by a research institution is expected to be able to bridge the gap between science and industry. Powel and Micallef (1997) argued that technology, however, is never only meant as a statement of the advancement of human knowledge, rather technology is a cultural output that is created to make life easier. Hence, the last item of the Three Devotion of Higher Education (TDHE) of a university is to transfer knowledge into a practical form that is applicable for the community at large. The transfer of knowledge as exhibited by a service to the communities by the university is to ensure that technological innovations generated by the universities can be properly and effectively disseminated to public at large and available all times. This is an important step to accomplish the true purpose of technological advancement activities by universities in Indonesia.

In the mean time, the urban planning domain as a branch of science is often defined as a part of a public engineering domain that is ultimately linked to services for the general public (Friedmann, 1987; Forrester, 1990). In the context of public services, the planners are committed to ascertain that public interests will be well served. Good public services can therefore be said as services that are signified by effectiveness, efficiency and responsiveness to the needs of the communities (Widodo, 2001). There are several approaches can be employed to create good public services. For example, the strategic location of a service center, which reflects the spearhead of a service. The location should be easily accessible, flexible service hours, dedicated service officials, and valid service outputs. Public services that are frequently needed by the community at large, in Indonesia, are any kind of administrative services provided by *Kelurahan*. *Kelurahan* office provides many kinds of public services, such as issuing Identity Card of the Citizens (*Kartu Tanda Penduduk, KTP*), Family Registration Card, Birth Certificates, Domiciliary and Changes of Address, and the likes. The *Kelurahan*, as the spearhead of local government and the lowest administrative units of local government, can also be utilized to assist the other administrative data completion, demographic survey, basic infrastructures inventory and urban planning and management. These services are heavily dependent upon archiving, recording/documenting, updating and retrieving databases. Unfortunately, the database on spatial compositions, such as demographic distribution maps and infrastructures is rarely updated and left obsolete for a long time. Data renewal is often neglected because of some reasons such as lack of human and financial resources. This obsolete data makes the validity of product/output is being questioned by the potential users.

The data and information required for public services in *Kelurahan* offices and must be readily available can be statistical data and spatial data. Statistical data administers demographic developments in quantity terms, while spatial data shows the phenomenon of administrative boundary and spatial distributions of the social and economic attributes. The practical usage of spatial data is directly linked to the general public. Publics can, for example, directly observe the layout illustrations of certain areas, looking for various potential aspects of their interests and using the insight as an input for decision making process. *Kelurahan* as a public service agency is strategically positioned for providing these spatial data providing their strategic role as the spearhead of the local administrative service unit. This is also because of their familiarity with their local communities and conditions at their localized areas. The data validation can therefore be conducted in a smaller scale, localized and with higher accuracy.

In presenting the spatial data, the concept employed was a geographical information system. Geographic Information System (GIS) is an information system that is designed to work with spatial-references or geographical-coordinates data. As Puntodewo et al. (2003) asserted that Geographic Information System as an information system with basic components in the form of hardware, software, geographical data and human resources that work effectively together to collect, store and repair, renew, manage, integrate and display the data in the form of spatial-based information, the GIS then a suitable tool to accomplish this work. However, to what extent the level of acceptance by the local public officers is, we need to reveal the fact prior to further development and dissemination of the system to the whole municipality by our university as a change agent.

1.2 Implementing Spatial Information System in Kelurahan Kepatihan Wetan, Surakarta, Indonesia

Surakarta is a city with dynamic and prominent developments, particularly during the last five years (2010-2015). However, this rapid development has not been equipped with sufficient data-collection and processing capacity by the local government officials. To make the system swiftly available, the structuring of the geographical information systems for *Kelurahan* is one of the crucial steps to disseminate an applied information technology for the publics and communities at large in assisting the processes of data collection, data storage, and data retrieval to be displayed as a service product/output. As a case, the dissemination and establishment of the system was organized in *Kelurahan Kepatihan Wetan*. *Kelurahan Kepatihan Wetan* has been selected as a showcase for the study for their geographical location suitability and readiness with respect to human resources and workload of this Kelurahan comparing with others. The activity was organized by the State University of Sebelas Maret (UNS), as one of the prominent change agents in the municipality. UNS organized the activity for some Kelurahans, called collaborating kelurahans. However, the focus of activity was centered in the *Kelurahan Kepatihan Wetan*.

The purpose of the activity was to introduce and establish a geographical information system to the officials in the collaborating *Kelurahan*. The activity was conducted in three stages: (1) identifying the need for a geographical information system, which in this case was the identification of the needs of *Kelurahan* officials to support their tasks and responsibilities for better services to the citizens; (2) building and installing a geographical information system for collaborating *Kelurahan*; and (3) providing tutorials for the implementation and application of a geographical information system for collaborating *Kelurahan* officials. The identification of users' needs and/or demands was conducted using a limited discussion method that resulted in a list of data requirements based on users' activities. The next stage was creating a geographical information system and installation of the system at the *kelurahan's* computer as needed and the last stage was providing tutorials about the application and the practicability of this dedicated geographical information system. The participants in this training and tutorial session were from the collaborating *Kelurahan* with five officials from each *Kelurahan*. We considered the training and tutorial as important as the essential part of the sustainability of the system. Otherwise, the system will not be sustainable.

1.3 Evaluation of System Implementation

Evaluation of this activity was conducted in three months after the third stage of the program took place. Using the methods of in-depth interview, evaluated officials were questioned about the usage of the spatial information system in data renewal and their daily activities. Early findings showed that the officials did use the spatial information system in their daily activities of providing services to the citizens. The service, for example, providing map on request basis and map of the basic infrastructure including attributes data. The service was free, or service charge will be applied in a very low and affordable rate. Even though the use of the information system was at a good rate in few early weeks, only few collaborating *kelurahans* were interested to develop the information system furthermore. This is particularly due to GIS needs high maintenance costs, while limited budget available in each collaborating *kelurahans*.

Although the user interface of the spatial information system has been made simple and customized to the needs of the *kelurahan* official, the intense use of the spatial information system seems to only occur in the early weeks after the system was handed over to the *kelurahan*. Low level of acceptance toward new technology was the background of the issues raised in this paper. This paper will discuss the factors that led to the low level of acceptance of village officials to the spatial information system disseminated by the UNS through Three Community Devotion of the Higher Education.

2. Methodology

This paper discusses the evaluation of the community service activities through the establishment of kelurahan-based GIS focusing on its sustainability i.e. long-term benefits gained by the *kelurahan* as service provider and citizens as the customers. In general, the evaluation method was undertaken by an ex-post evaluation system that assesses the dissemination of technology after full implementation process is completed. The success indicators of the spatial information system implementation was measured by the characteristics of practical use and the level of acceptance of the relatively newly introduced system. This study used an inductive approach to identify the research problems that focus on two issues, namely acceptance of the *kelurahan* official towards spatial information system technology and the factors affecting the level of acceptance and practicability of the implementation in collaborating *kelurahans*. The conclusions drawn by this study was based on the results of the surveys. This study employed primary data collected through observation and in-depth interviews. Observation was held three months after the full implementation and completion of the program. The interview was undertaken with the system operators and his/her supervisors in the *Kelurahan*, Head of *Kelurahan*, and other relevant officers at *Kelurahan* Office as respondents.

The variables in this study were derived from two groups, i.e. group variables to measure the use and level of acceptance and group variables to identify the factors affecting the main variables (Figure 1). The first variable group consists of two set of variables namely the level of use as suggested by Breilling (1996) and the level of acceptance as confirmed by McCall (2004). The second variable group consists of two sets of variables, namely internal factors introduced by Breilling (1994) and environmental support factors coined by Yeh (1991). Interview transcript was then processed by classifying data into these two groups.

3. Dissemination of Technology and Level of Acceptance by Public Officials

3.1 Dissemination of Technology to Kelurahan Kepatihan Wetan

The purpose of building a geographical information system in this study is to integrate spatial data and statistical or attribute data in the collaborating *Kelurahan*. The data presented in information system is the latest data that has been validated in the field (ground authenticated). The process exhibits an improvement in data quality that will become the inputs to the potential *kelurahan* to support their daily tasks and responsibilities. Others customers such as students and academics can also get benefits from the accuracy of the data presented in rapid manner and readily available. They can use the timely updated data in their research, delivering lectures and providing other services. For this activity, both hardware (Computers and Global Positioning System device, GPS) and software i.e. ArcGis were used to compile database, create spatial data and update data. The earth contours map was used as the basis map and was validated based on the results of field surveys.

We organized the activity in three stages in sequence. The stages are (1) Identifying the users' need for a geographical information system

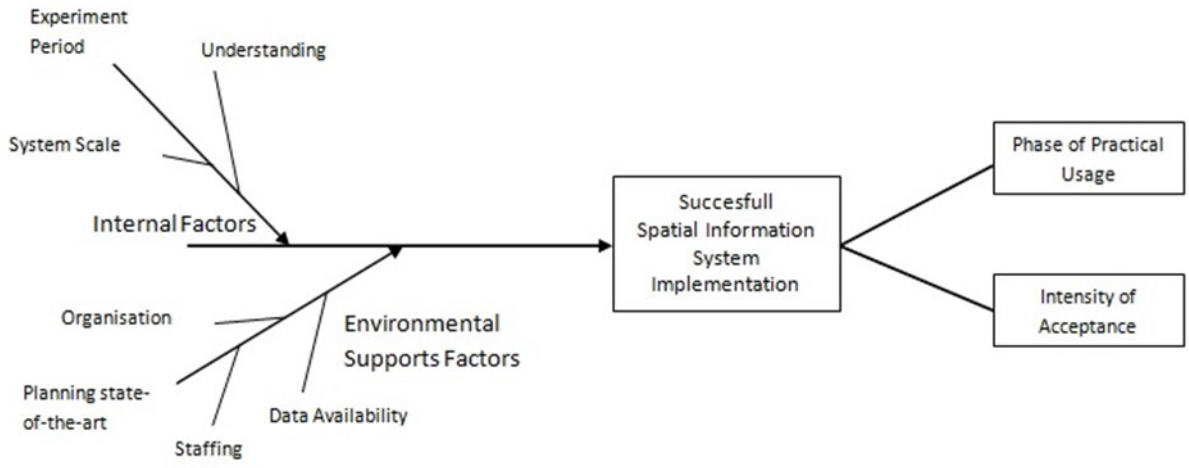

***Figure 1**: Analytical Framework*

(2) Building spatial and attribute data (3) Training and tutorials for the relevant officers in the selected collaborating kelurahans.

3.1.1. Identifying the users' needs

In GIS, the display design and the mechanisms for information and data retrievals must conform to the need of its user. Conformity between information system features and its users' need will ascertain its efficiency and effectiveness. The users' needs, in this case, were the needs of *Kelurahan* officials in *Kelurahan Kepatihan Wetan*. We conducted the identifications through limited group discussions that is focused on routine activities and important information needed to showcase the potential aspects of *Kelurahan Kepatihan Wetan* that may be of citizens' or others' interests. For instance, to start-up business and industries in the municipality. Identification of users' needs has been conducted through limited focus group discussions. The outputs of the discussion are the list of users' need including wish list. The users need to retrieve information on (a) daily and regular activities by using geographical information system, such as creating maps of *Kelurahan*, compiling *Kelurahan* profiles, and introducing the potentials of *Kelurahan*; (b) data required to support regular activities such as numbers and distributions of citizens, government and public services facilities, educational facilities, economic infrastructures, religious service facilities, and roadways; (c) person in charge regular activities including the operators of spatial information system; and (d) the geographical information system displays, in the form of maps.

3.1.2 Building spatial and attribute data

In post-identification of the users' need, we conducted a survey to acquire both spatial and non-spatial data. The survey was conducted by using the marking and tracking methods. All the road paths and socio-economic infrastructures identified in the first stage were surveyed and their Cartesian coordinates were recorded. This data was then used as the basis data for the integration into the basic map. Since the data were recorded directly based on the field measures, the validity of the data was high. Data collected during the surveys are (a) *Kelurahan* boundaries; (b) Lower Neighborhood units (RT) and Upper Neighborhood unit (RW) boundaries; (c) roadways; and (d) governmental and public services facilities (education, health, religion). Then, the integration of spatial data and non-spatial data. This stage was conducted using ArcGIS software which was a tool to plot basic data attributes such as infrastructure data on the basic map displaying administrative boundaries in the collaborating *Kelurahan*. As the result, data on the potential attributes of the collaborating *Kelurahan* can be displayed in the form of a digital map. The map can be updated anytime, not merely on obsolete statistical information. Data about the potential attributes of the collaborating *Kelurahan* can then be accessed and displayed in the form of spatial distribution. This innovation will enrich the information and can be accessed as one of the products of public services in the collaborating *Kelurahan*.

3.1.3 Providing tutorials about geographical information system for Kelurahan

Training and tutorial sessions were held to directly introduce spatial information system to the collaborating *Kelurahan*. Five officials from *Kelurahan* were participated in this training sessions. In general, all the participants have learned how to use the geographical information system to update and add new data, to perform simple analysis, and to print a map as required. The output was a map of the potential

Figure 2: *Map of Kelurahan Kepatihan Wetan as the Output of Computer-based Information System*

attributes of collaborating *Kelurahan*. These maps were subsequently be used as teaching materials during tutorial sessions (Figure 2).

Rogers (1983) asserted that dissemination of technology is a process of diffusing a proprietary technology owned by an institution or an individual via certain channels of society members (Rogers, 1983). In similar manner, Barton (1995) argued that technological introduction based on its practicability is also a technological dissemination by utilizing a certain approach in practicability and suitability. Meanwhile, another notion in same line of thinking on the dissemination of technology was offered by Havelock (1973). According to him, there is a technological diffusion using a different approach that tries to change users' perceptions in order for them willing to adopt that new technology. In this activity, utility approach was employed by providing tutorials about a geographical information system in the collaborating *Kelurahan* so that the potential users can learn on the practicability of this technology and their willingness to implement it.

According to Rogers (1983), in the process of technological dissemination, there are several distinct stages: (1) receiving a new knowledge, (2) request to adopt it, (3) decision whether to adopt it or not, (4) implementation of the new technology, and (5) believing in the benefits and usefulness of the new technology. When the potential users decide to reject the new technology, then obviously, there are no fourth and fifth stages. When the decision is to adopt the new technology, then naturally, it carries on to the fourth stage, the implementation of the new technology. In this fourth stage, the usual ways the potential users do their things need to be adjusted to accommodate the implementation and the application of the new technology. While technological dissemination can also be categorized based on the sources of innovation, the act of technological dissemination can be one of two types, either bottom-up or top down dissemination. Bottom up dissemination is a process in which the innovation is created by a community to be spread out to other communities which include governmental agencies, academic communities, and scientists as part of the general communities. The other type, top-down dissemination, is a process in which the innovation is created either by scientists, academics, or governmental agencies and be spread down to the general public. Based on this categorization, our servicing activity was a top-down diffusion of innovation.

Based on the above theory of technological dissemination, the targeted people, who is in this case is the officials at the collaborating *Kelurahan* have undergone all four stages of technological dissemination, down to the implementation of the new technology. The first stage, technological introduction, was conducted during proposal preparations and collaboration offerings. This stage has been accomplished easily since our proposals offer many benefits of this project activity. Moreover, geographical information system is usually implemented and employed only by officials in municipal and national government agencies with a relatively large resources. Our collaboration to introduce this technology was very well received by officials in the collaborating *Kelurahan*.

In the second stage, requests to adopt the new technology were constantly brought to front during the identifications of users' need and data surveying processes. The students and the assistants conducted surveys using simple devices that were rarely used by the collaborating *Kelurahan* officials. The information system created was attractive as was indicated by the officials' curiosities and their willingness to discuss about designing a similar system. And in the next stage, they are judged whether or not they accept the new technology by inviting them to attend a tutorial session. By attending the tutorial session, the *Kelurahan* officials gained insights about a geographical information system that changed their perceptions and how they do their daily tasks. We installed the spatial information systems in the computers of collaborating *Kelurahan*. The next stage was to confirm and justify the benefits of this new technology. This can only be recognized some times after the technology has been implemented. The sustainability is then the crucial matter.

The evaluation was done three months after implementing technology in collaborating *Kelurahan*. Early findings through preliminary surveys revealed that spatial information system had been implemented in a computer system at the *Kelurahan*, but active utilization was only intense in the first few weeks. In three months during the evaluation, routine work using the system was only completion of the data that has been taught in the tutorial stage. Once the infrastructure data completed, the spatial information system was no longer optimally utilized.

3.2 Factors Affecting Acceptance of Kelurahan Official towards Computer-based Information System

Spatial information system, particularly computer-based information system, is a tool for local government officials in doing their daily routine tasks. Breilling (1996) suggested three practical use of spatial information system for local government to include (1) presentation tool, (2) coordination tool and (3) public participation tool. These three uses of spatial information system do likely form phases in accordance to the practical benefit and complexity in implementing the system. During the first phase, spatial information system produced maps of both spatial data (natural landscape, man-made infrastructures, land-use) and attributes data (demography, economic productivity, etc.) of the area. Various maps can be prepared by using spatial information system based on the detailed information needed by the users.

Maps are a better way to present detail information of an area compared to big number of tables and list. On the second phase, maps, which are generated by the spatial information systems, must be combined with other perspectives of the area to induce a general overview and link different information from different disciplines. This coordination phase gives way to new information for planning purposes, including constraints and conflict across the disciplines. In this phase, spatial information system becomes a strategic platform for local government units from different disciplines to talk in the same language. The last phase in spatial information use is the public participation tool. By using the maps produced by spatial information system, local government may invite public at large to raise their concerns and opinions on various information and plans embedded in the maps. Thus, public participation may occur during the whole process of planning, i.e. (1) public crosscheck the data compiled by the local government with their own information, (2) public may actively giving opinion and raise concerns through the planning process, (3) public may monitor the implementation of the plan, and (4) public may continuously evaluate the changing environment of the area by comparing it to the plan.

In the case of spatial information system implementation in *Kelurahan Kepatihan Wetan*, Surakarta, the practical use of the system was at the first phase. Public officials in *Kelurahan* office are only producing maps of the *Kelurahan*, and are mostly to present infrastructure data. The maps produced by operator were based on the data that had been compiled. In *Kelurahan Kepatihan Wetan*, until three months after the training was

held, the data compiled into the system was simply infrastructure data of *Kelurahan*. It was not much different from the results of the previous tutorial.

In addition to analyzing the phase of spatial information system use on *Kelurahan Kepatihan Wetan*, this study also found that the level of acceptance of the officers was also at an early stage, namely at the stage of information sharing. As McCall (2004) identified four levels of acceptance in spatial information participation for local planning, i.e. information sharing, consultation, involvement in decision-making, and initiating actions. The highest level is initiating the actions. Initiating the action level in this case may be signified by the ability of the local government to plan a development action using data and decision-making procedures provided by the spatial information system. The key indicator of this level is any system development initiated, owned and implemented by local government. Public officials in *Kelurahan Kepatihan Wetan* was yet to achieve this level since there was no difference on the spatial information system during three months after the tutorial took place.

The second highest level is involvement in decision-making process. The key indicator of this level is the inclusion of the person in charge and the spatial information system to the decision making process. In this particular case, the decision making that takes place in Kelurahan level is not strategic decision. Daily routines are well described in the guidelines provided by the City Government or Central Government. Thus, the spatial information system and *Kelurahan* officials are only providing input for the planning. The involvement in decision-making process was also yet to be achieved.

The third level of intensity is the consultation. In this level, spatial information system is used as a practical tool for the public official to give consultation to end-user data. In many cases, end-user have already had data they need from other sources. They need to crosscheck on the validity of the data to *Kelurahan*. In this case, *Kelurahan* officer then give a consultation on the data. The key indicator in this level is the presence of updating mechanism to make sure that the data provided in the spatial information system is not obsolete. In *Kelurahan Kepatihan Wetan*, there is no guidelines for updating mechanism, rather the officer in charge updated the data whenever they know that some changes took place. The updating data activity was neither periodical nor comprehensive. Some data may be more obsolete than others.

The lowest intensity level is information sharing. In this level, the key indicator is map-producing activity. This activity has happened in *Kelurahan Kepatihan Wetan*. The *kelurahan* official produced maps based on the request from the end-users. During three months, there were approximately five maps per months produced by *Kelurahan*, mostly to present infrastructure data and borderline of the *Kelurahan* and the sub-areas.

Based on the findings above, the level of use and acceptance of public official in *Kelurahan Kepatihan Wetan* was at low level. *Kelurahan* was basically used it for only presenting data for other users. As Breilling (1996) argued that low practical usage of spatial information planning is caused by three practical obstacles, i.e. (1) understanding of the spatial information system, (2) the scale of the system, and (3) experimental period. While Yeh (1991) considered four factors, i.e. (1) organization of the decision support system, (2) data availability, (3) state of the art of planning, and (4) staffing. McCall (2004) underlined internal factor of the spatial information system operators, while Yeh focused more on the environmental support of the system.

In-depth interview with the operator of the spatial information system in *Kelurahan Kepatihan Wetan* revealed key information from each factors. Generally, both internal capacity of the operators and the environment support were yet good enough to ensure better use level and better level of acceptance. With respect to the internal factor, the most affecting factor is the experimental period of the system. Three months were such a short time considering that spatial information system as a new thing

Table 1: *Internal Factors and Environmental Factors*

Factor	Sub-factor	Findings
Internal	Understanding of Spatial Information System	Understanding the system, introduced in the training, was sufficient to build more complex spatial information system or simply broaden the scale of the system
	The scale of the system	The scale of the system has fitted the need for data in Kelurahan level since the planning activity in Kelurahan level is mostly the implementation of city planning program
	Experimental Period	Experimental period was too short, the official still trying to figure out how to utilize the spatial information system in the daily activities
Environmental Support	Organizational Factor	• No guidelines for the utilization of spatial information system in daily activities • No specific role of the spatial information system in planning in Kelurahan level
	Data Availability	Spatial data are mostly available although some surveys may be needed Non-spatial data are available
	State of the art of planning	• Planning procedure theoretically recommends the use of spatial information system and maps produced from it • Planning procedure normatively considers spatial information system as a tool in urban planning
	Staffing	No staff were responsible to run and ensure the sustainability of the system Any staff in Kelurahan office can access the spatial information system

on the table. Meanwhile, from the environmental support factor, the organizational and staffing aspects are the most affecting factors. There were no changes in organization in Kelurahan so that the spatial information system has no specific role besides presenting data. Kelurahan officers said that there should be new guidelines that include spatial information system in daily routine activity. Without any guidelines, the spatial information system will be treated as extra activity with no obligation to work with it. Along with new organization, staffing in the system may become more transparent. During the evaluation, there were no particular officer that has the obligation to run the system. Findings from in-depth interview can be seen in Table 1.

4. Conclusion and Recommendation

4.1 Conclusion

From the above findings, we can conclude that the environmental support factors are more likely to affect the success in implementing computer-based spatial information system in *Kelurahan Kepatihan Wetan*. This condition supported by arguments of Yeh (1991) that even though the system had been designed as simple as possible in its user interface, the sustainability of the system still lies in the hand of the decision-makers. The internal factors are relative easy to intervene through practice and tutorial, while the environmental support factors are more complex and has many things to do with the planning system as a whole.

Staffing is the most crucial factor for the sustainability of the system. The underlying factor on staff was basically because of the existing working culture of public sector staff, where if an unclear responsibility was assigned to a group of staff, the "if no one else take the work, that is not my business" prevails. The solution is actually quite clear, assign one staff to be responsible for this GIS for urban planning and management with clear guidelines, clear key performance indicator, clear objectives and sufficient support from the top management. By this, the sustainability of the system will be higher.

4.2 Recommendation

Further study will be necessary to focus on the environmental support factor to gain broader understanding on the practical obstacles in implementing computer-based spatial information system. In Indonesia, the planning procedure is some kind normative issue with a little room to accommodate the changes. To implement a sustainable spatial information system as a tool for local planning, the guidelines in preparing city and region plans need to be revisited. From the planning perspective, it requires a fundamental changes in planning mechanism in Indonesia, although the changes may be technical instead of philosophical nature. Academic perspective on this matter is important to provide a theoretical basis on the implementation of spatial information system to ensure better urban planning process. From the local authority side, the change on working culture needs to be introduced. The culture of everyone's business must take precedence over no-one business. It means that if no one do it, some one must be able to do it.

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