

# A Preliminary Model of Community-based Integrated Information System for Urban Spatial Development \*

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**Abstract:** This paper describes a research on building Integrated Information System for Urban Spatial Development. The objective of the research phase discussed in this paper is to define a prototype of information system that basically facilitates information communication among involved participants in an urban spatial development planning. The system is designed by putting stress on local community. Their spatial perception and the availability of GIS technology in local context become constraints in building the system. Internet becomes the main alternative for information dissemination for this phase. This is also supported by the use of web-based GIS as framework of information system. Through few socialization sessions, the proposed model has indicated a prospected alternative to be seamless communication media among participants. To support an easy-access for local people in using this information system a mechanism of information access has been proposed in the form of local information center.

## 1 INTRODUCTION

The urgency for developing this digital prototype is supported by the evidence of increasing needs for information system that can be relied on as an effective tools for communication among several parties, presently identified as city stakeholders, involved with urban spatial development. City of Medan, in North Sumatra Indonesia, with a population of more than two million as urban setting of this research has experienced so many negative impacts caused by negligence of the importance of communication role in implementing urban development program.

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This paper discusses a completed research, which is also a part of a long-term one under the topic of Integrated Information System for Urban Spatial Development. That's why digital model built in this phase is called preliminary model. As communication is the main problem in this phase, focus of this research is to develop the interface. So far the research has produced a prototype of an interface, which is projected for a continuous development during the long-term research. What is to be expected from this interface prototype is there will be emerging indication that socializing urban development among local people may work far better. Another indication is there will be more space for coordination among institutions involved in urban spatial development and no more overlapping urban public works will occur.

## **2 FACILITATING PEOPLE PARTICIPATION**

Community-based information system in this research means information system that accommodates community participation within urban development program. This participation is defined as people's role in decision-making process in an urban development planning and design. Community involvement in planning means giving management authority to people in a form of power sharing (Arnstein 1969). This theory acted as basis to develop public participation ladder that describes distribution of right giving to people to access information in decision-making process (Weidemann and Femers 1993). The public participation ladder stratifies the right into six levels: public right to know; informing the public; public right to object; public participation in defining interests, actors and determining agenda; public participation in assessing risks and recommending solutions; and public participation in final decision. These levels are defined as hierarchy, where the upper level is reached after passing the lower one. Regarding the information system that becomes the target of this research, it defines the community as users who utilize information from local government for their interests. Therefore it is not yet projected to enable people to reach the highest level of public participation, where people are fully involved and authorized in making final decision in planning process.

Information technology application as means to access the information system should acknowledge the existing limited resources in the community. Ignoring this aspect will lead to a wider gap of information access, which in turn will move farther community away from public participation process (Castell 1999). Geographic Information System (GIS) as one promising alternative to facilitate the participation process, which also becomes the basis in conducting this research, has potential to avoid that critical situation. The application of alternative technologies, such as audio recording, visual recording, community network, automated visualization, collaborative planning system and distributed geographic information in GIS can enhance its capability as means for participatory planning (Howard 1998; Ceccato and Snickars 2000; Geertman 2002). These alternative technologies have been arranged in line with its potential to accommodate various public participation techniques. Referring to this formulation, this research has to identify which technology is appropriate for what existing resources available on particular local neighborhood.

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### **3 METHODS**

As case study area, a specific site was chosen considering its characteristic that's suitable to represent most of urban spatial problem. This mixed area, which is predominantly occupied by housing and shop-houses, has a scattered spot belonging to slum. This made the project more challenging. In line with community-based principle as main idea, the first step in building the information system is to identify information needs concerning urban spatial developing matters of every participant involved with spatial development. They are divided into three groups that may represent all involved participants: local inhabitants, public institution including those from municipal government, and private institution mostly representing potential developer to be involved in revitalizing case study area. In identifying information for building the interface, field survey is more focused on information needs of local people since this group is usually ignored in the past. As the main communication means the interface is expected to be the principal tool in bridging communication gap that always happened previously. Result from field surveys indicate that urban spatial information that becomes main concern for local people is about infrastructures and cost implication regarding spatial changes.

From public institution side, one significant constraint is the fact that limitation of information technology resources, including tools and skillful person for operation, exists inside all line sectors. The result of survey on the institutions reveals that most of them use same CAD application program. This CAD program is used as base program for developing and maintaining physical databases concerning urban infrastructures that belong to their authority.

### **4 THE PRELIMINARY MODEL**

#### **Database**

The core of the preliminary model is a prototype of databases of urban spatial physics and structures regarding the case study area. Social GIS data becomes the main consideration for identification of which community and local data should be included in main databases (Nicolson 1998). The information for the databases comes from the institution, which manages each urban physical structure. Of the city government, the information is expected coming from the Department of Urban Planning and Building management and the Department of Housing. Principally the database built on this information is in the form of digital map completed with site and building plot, and equipped with the urban regulation connected to each section on the map. Another targeted information from this part is that for building databases of site property. This information comes from the Bureau of Land Property.

Regarding the physical infrastructures, the database contains the information on urban utility, such as road and street condition, drainage system and its physical

installation. The information about other urban utilities, such as electrical installation, water system, and telecommunication, is designed in such a system that only shows the information of its physical structures. This means the database contains information about coordination system of physical elements on site such as the position of electrical poles, telecommunication poles, and water pipes, all either upper or under ground.

Another important attribute of this database system is full information about local residents. The information is developed based on each house location in the area. This kind of GIS enables the user to access general information about the inhabitants, as well as information about physical condition of their houses.

## **Interface**

Designing digital model for this databases system may be considered as designing the interface for the system. This is based on the hypotheses that the main aspect in determining the success of an information system is the media, which is in this case is characterized by the interface.

Web based interface is the most efficient method in developing the interface considering limited resources for private networking (Shiffer 1995; Evans et al. 1999; Kingston et al. 2000). Therefore Internet becomes the most effective tools for accessing data for this phase. Digital databases of the urban spatial physical data is built using similar CAD program to the program that is used in most public institution considering its familiarity. Interface display is developed based on digital area map (Figure 1). This web-based GIS interface is accessible through Internet by all parties projected to be involved with any prospective urban development sector employed on the case study area. This is to be in line with the mission in providing easy access to public information as well as more room for people participation (Evans et al. 1999; Ceccato and Snickars 2000). As a preliminary model of integrated information system, through this interface users may access prospective digital model of the revitalized area (Figure 2) along with textual information regarding the implication of the project. In this model the information is limited on cost implication and technical matters regarding construction process.

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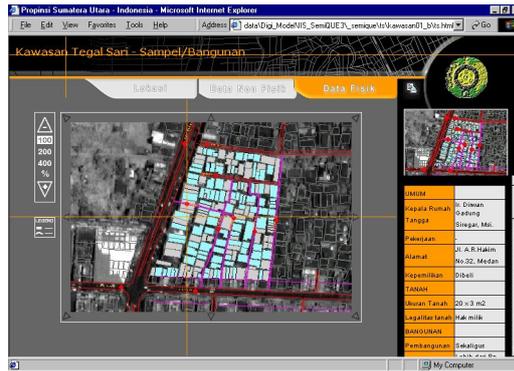


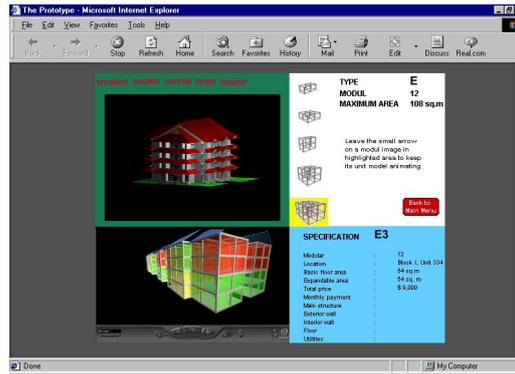
Figure 1 The prototype interface



Figure 2 Example of digital model display

Basically all field data regarding physical elements that are displayed in the interface are utilized from various sources at several public institutions. Most of digital drawings came in different format. The only similarity that a little bit helping in building the databases is all was built in *dwg* format through AutoCAD application.

In building the interface, the spatial digital model, both buildings and environment, takes the most important role. These models are equipped with conventional animation and virtual reality animation. All models are integrated with all modes of information, such as: texts, images and animated images (Figure 3). The interface also becomes the main material for trainings on developing the Community Information Centers, which consequently should be designed user-friendly.



**Figure 3 Example of integrated information display**

Each type of interface is equipped with user's feedback function that becomes the main facility in this information system to accommodate community participation in this phase. This function is implemented by attaching user's feedback form on the interface. All is intended to obtain people's aspiration about any physical planning implied to local neighborhood. Besides for municipal government, they can expect that local people will report any changes occurred on field by using that facility. Still to make it of maximum implication it needs operator as people facilitator to interact with the interface.

All models are designed in such a system that enables the users to access them as an online data, either through a local network or through the Internet. It is therefore designing the topology of the Network and its connection to the Internet also becomes an essential aspect among the whole system. Decision about this aspect and the urgency of developing community information center becomes a determinant factor in assuring successful program, since this facility will be the information node where people participation will be relied on.

### **Community Information Center**

Among the three activities, building the information center plays the most significant role in assuring the success of the prototype. The first stage in the context of further development of the information system is to identify individuals who will be responsible for maintaining and updating the data. In the future these persons or group will be in charge in the process of developing Community Information Centers (CIC's).

As part of building the prototype phase, the establishment of the network of the CIC is focused on building the CIC, which is projected to be the for the Urban Development Information Center (UDIC) in the future. Belong to this stage is also creating training modules for operating the information system and managing the centers. The CIC for this stage is built at the Department of Architecture University of North Sumatra, which is turn to be the future UDIC (Figure 4). This decision is based

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on the fact that this institution has the biggest potential in keeping the main function of information system fully operated.

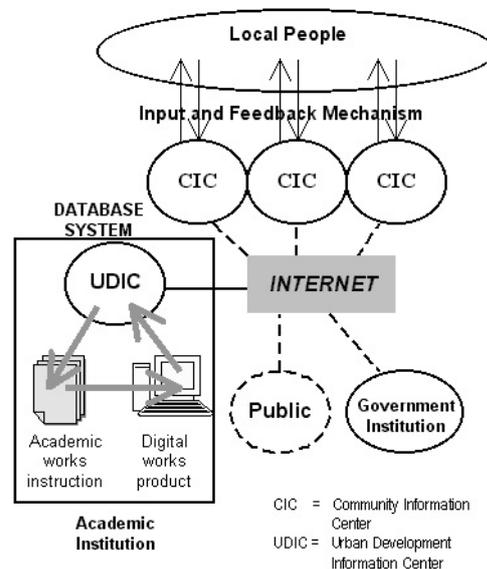


Figure 3 A model of updating and maintenance mechanism

### Sustainability Aspect

For sustainability of databases development, academics involvement becomes a promising solution. Integrating databases development with courses program is an ideal alternative. CAD based information in this research itself is developed by integrating it with CAD course works at Department of Architecture University of North Sumatra (Hamid 2002). As output of this research, problems around accessibility of the information become next urgent issues to be utilized in the following research. This research proposes a model of local information system where local people can utilize it as the information node to access the system. Besides networking, how local people could familiarize the information is another significant issue. This preliminary model still needs facilitators for operating the program considering computer illiteracy of local people. Training program also becomes part of this research package so that all people from the three parties may operate and update the system by themselves in the future.

## 5 CONCLUSION

As a preliminary model this prototype has indicated a prospected program in facilitating socialization and control of several aspects in urban spatial development, such as:

The prototype leads to a more communicative and user-friendly methods in socializing urban development project

The prototype gives way to a more integrated development program among the involved institution, since all physical aspects of a particular urban area has been put into such an online system that can be accessed by each party

The sustainability of the proposed information system should be planned by determining the most potential party in assuring the continuous program in updating and maintaining the data. A group of concerned people from academics should be considered in first priority.

The information system should be continually developed toward a more sophisticated system, such an expert system, in order to have a more automatic and efficient operation and maintenance program.

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