

Towards a Pragmatic Neighbourhood Development Planning Model.
Urban Spatial Information System - USIS as a decision tool in an
automated & integrated design environment

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1. THE NATURE OF THE PROBLEM

This research project deals with the planning process, more specifically with the process of formulation of an urban plan which aims to solve a given problematic situation in a city.

Some important facts are identified as the main CAUSES of the actual problems faced by urban planners in developing countries which hinder the impact of their professional contribution and limit the affectivity of the planning process:

1. The exchange of information between the various levels and actors involved with the planning process is far from being optimal. Urban information is not only scattered among organizations but also among different disciplines and fields of activities. Besides that, the available information also suffers from a chronic difficulty of updating and reliability.
2. The planning process is fragmented in different fields of specialization which reinforces the disintegrated character of decision making and the confined view over the urban environment.
3. The rapid process of urbanization and the increasing complexity of the urban problems were not followed by the development of planning tools and techniques. Such developments would have provided urban planners with the means to respond more effectively to actual challenges. But unfortunately what one sees is a backlog in urban planning and design tools.
4. Despite the extraordinary development in the field of information technology and the appearance of numerous hardware and software created to respond to planning needs, there is still a lot to be developed. There is still a need to develop and to explore the possibilities of existing software programs in order to create applications appropriated to urban planning and urban design needs.

The combination of the facts mentioned above is considered as the main cause of the problem to which this research project is addressed to.

It is argued that some failures and limitations of urban planning are directly related to the absence of appropriate tools and instruments for providing practitioners with means to exercise strategic choices and take decisions during the planning process (see Figure 1) within an integrated planning environment.

Tools and instruments which would not only solve the fragmentation

of the planning process but at least would lessen its disintegration. Such tools would help to meet dual ends: the conceival of an integrated and comprehensive view of the urban environment and the materialization of more reliable forecasting and scenario building. Time consuming data collection, inefficient manipulation and limited access to information seem to contribute to the problem since it hinders the performance of urban planners.

In summary THE PROBLEM identified by this research is:

There is a lack of tools, methods and instruments which would help urban planners to accomplish a dual objective: to envision a comprehensive view of the urban environment and to develop quick scenarios and alternative outcomes of decisions taken during the process of plan formulation.

Failures and inefficiency of urban planning responses are directly linked to that. The absence of such a tools, methods and instruments are turning the result or output of the urban planning process obsolete before it can be implemented, and very often it is constraining rather than facilitating the development process. The fragmented character of the planning process emphasizes the unilaterality of decision making, the dominance of certain disciplines and the pure physical orientation of the planning outcome. On top of that, a lot of resources and opportunities are squandered since the professionals directly responsible for making choices lack the necessary information to take strategic decision.

To solve this problem, it is argued that it is essential to develop and implement an integrated urban planning process. Such a process would result from the merging of (1) an efficient use and access to urban information which is relevant for the process of plan formulation, (2) the use of a dynamic urban planning tool and (3) the application of an urban planning model where procedures, steps and levels of decisions would be clearly defined. This would provide professionals with a conceptual framework that would (re)capture the multidisciplinary of the process and materialize an integrated vision of the urban environment. And hopefully, this will increase the efficacy and efficiency of the planning process.

2. THE ACCESS AND USE OF INFORMATION

One of the fundamental questions to be resolved before starting any planning activity is to define what type and nature of information is needed for launching a planning process. What information is needed? What are the basic requirements in terms of information? Why is it needed? How to collect, store, manipulate and retrieve this information during the planning process? Which sources of information can be considered and how to extract and (re)generate secondary information from it?

In the first place, the type of information needed or the demands for certain type of information will be greatly defined by the purpose of the activity in question. Whether it is to serve the purpose of urban management, urban design or urban planning procedures.

But what seems to play a major role in the delineation of information requirements is the early definition of the problem one intends to tackle or solve through urban planning. A plan to revitalize an inner city low income neighbourhood under process of urban decay will demand a specific type of information which will differ from a situation like a neighbourhood mainly occupied by middle income groups and situated in the intermediary ring of the city. Both the social and physical environments are different and the type of problems one identifies will also differ. The needs are different, the nature of the problems are different as well and so as the information requirements for starting formulating a plan.

The available source(s) of information will also play a role in defining the minimal and accepted degree of information necessary for implementing a planning process. Whether will be possible or not to extract and/or to regenerate data from original sources which can be useful for urban planners?

The most traditional sources of information are:

- Population census
- Municipal database
- Field surveys and inventories
- Official documents and project reports
- Publications
- Maps
- Topographic cadastre
- Urban plans
- Aerial photographs
- Satellite photographs
- Remote sensed data

3. THE URBAN PLANNING TOOL

To make an integrated planning process viable, it is essential that urban planners have at their disposal a planning tool. A tool that may assist them processing large amount of different types of information while allowing the establishment of a dialogue system with other actors directly involved in the planning process. The storage, manipulation and data processing implies that the information will become accessible during the process of decision making. Thus, data management and the presentation of the information during the planning process becomes an important element for the dialogue system.

It seems that GIS's are providing the means to develop such a tool. A number of studies already pinpoints the strength of GIS in supporting analytical procedures of urban phenomena but there is still very little material showing its use in the process of plan formulation. This is one the aspects that this research will explore.

However, there is little doubt about the possibilities and advantages offered by recent developments in spatial information systems and the appearance of a large number of commercial Geographical Information Systems-GIS. They offer a genuine

opportunity to link graphic information with other non-graphic or thematic information in a very effective and dynamic way. All graphic elements in a map is directly linked to its technical, juridical, economic, social, economic, fiscal and administrative attribute through a structured database. Above all, there is a minimization of time, money, effort and the maximization of accuracy, sophistication, reliability and flexibility in producing and reproducing great quantities of geographically referred information. This seems to bring a fundamental change in the urban planning process and it is much likely to influence the way planners think and do business in planning.

Access to information becomes much easier and the professional planner is able to enlarge his/her substantial knowledge about the urban environment and take decisions based on a much more integrated vision. Thus, strategic decisions are greatly facilitated because urban planners increase their capacity to foresee scenarios and to forecast impacts of planning decisions with more accuracy and less time consuming than traditional methods. Rapid assessment of alternatives are done during plan formulation allowing an effective management of the process and the production of visual and tangible results. Map overlaying, topological and tri-dimensional models, virtual reality images are the most advanced outcomes of this technological development.

4. THE URBAN PLANNING MODEL & THE USIS

Because it joins different areas of knowledge and specific disciplines in one holistic framework, GIS offer on one hand a conducive environment for urban planners to develop and to operationalize an integrated planning MODEL. But on the other hand, it demands very strict methodological and organizational procedures for dealing with information. In other words, the introduction of GIS in the planning process will impose changes both in the procedural aspects of urban planning and in the thinking methods and dialogue systems among the various actors.

As said before, the substantial knowledge about the built environment is accomplished through the organization of urban databases which form the pillars of any geographic information system. This knowledge can be partially or totally treated as attributes or descriptive data linked with spatially or geographically referred entities, accessible throughout the whole process of plan formulation. That is basically why an USIS-Urban Spatial Information System becomes necessary for implementing innovations in the process of planning.

The organization of an USIS establishes the foundation of the integrated planning model. A fundamental decision is to determine what type of information will be collected and stored in the USIS. Preliminarily, one can think of the most essential information.

A reliable and updated view of the physical condition of the site, in the form of a map of aerial photography seem to be a must before initiating any planning activity. To complement that, one should think of data about the infrastructure and public utilities networks and their geographic references. Information about the

inhabitants and/or users of the site in relation to the building stock is a pre-condition for defining the social & economic profile of the site. This data covers the total of occupants per house, household formation, level of income, profession of the income earner, age group. In relation to the building stock, one should think of the building id, ownership, size, quality, type of construction, type of use, type of infrastructure. Next to that, land management related information should complete the databank. This data should inform about the tenure situation, the land use regulation (if there is any), administrative and registration codes, locations. On the map or aerial photography, critical sites should be drawn as complement of the database. These sites are places where flooded, erosion or environmental deterioration prone areas do exist.

It is argued that the organization of this information and the establishment of topological relations will provide the users of the model with the integrated and comprehensive view of the urban environment. This is the third step of the planning model.

In fact, the planning model is very simple. The first two steps are related to the collection and storage of graphic and thematic data. The former is done through different techniques such as digitalization of maps, aerial photo interpretation, scanning and map overlay. The latter is achieved through field work and derivation of existing reports and census data.

The emergence of the USIS occurs after that but its use in the process of plan formulation becomes the most critical and important step of the model. It is here where the USIS is tested in a concrete case study, where a plan is designed and proposals are formulated, where scenarios are built and various alternatives are generated in order to assess its feasibility. Steps 4 and 5 will provide evidences about the viability or vulnerability of the model. Whether it is possible to manipulate such information in a dynamic way during the process of plan formulation or not!? Whether or not a dialogue system can be evoked through these steps of the model? Whether specific procedures and a detailed series of steps will have to be created in order to materialize this part of the model or not? Whether a special customization of the software will be needed in order to resolve problems in the procedural steps of the planning process or not?

Steps 6 and 7 are referred to as the output of the model and/or analytical exercises based on the planning output. The final step presents the output in various forms.

What seems to be important at this moment is to define the type of information that will be stored in the USIS prepared for a particular situation and/or context. Only then it will be possible to put all components together and actually test the viability of this approach.

5. OPERATIONAL ASPECTS OF THE RESEARCH (from discussion paper III)

Some important steps can be delineated for a smooth operation of the research:

STEP 0

A comprehensive literature research was carried out and a lot of reading has been done on specific subjects like urban planning models, urban GIS and articles reporting GIS experiences and applications in different municipalities in developing and developed contexts. It is likely that this reading exercise will continue for the coming months. The systematization of this exercise has started already. Some working papers will be produced based on the findings and opinions built up from the researched literature. This is a step is concerned with a reporting activity that will continue throughout the whole period of the research.

STEP 1

There has been already training sessions carried out with PC ARC/INFO and with ArcView which provided me with a good insight about these two programs, specially ArcView. However, it is necessary to enlarge the knowledge and the acquaintance with the programs, their capabilities and possibilities for customization. It is worth to invest some more time on that in order to get familiarized with the tool and perhaps test the capabilities of ArcCAD as well. The accomplishment of this instrumental knowledge will continue during the coming year and will occur simultaneously with the former and other following steps.

STEP 2

To start with, it is important to check whether the existing data that has already been gathered is sufficient to start building the digital maps and graphic database. So that the first tests of data generation can be evaluated. The participation of our counterpart from Geodesie, Robert Kuunders, will be important at this stage in order to check the results and define what other possibilities and paths we could take.

There are cartographic maps and slides of the aerial photographs of the neighbourhood Reino-Gambeafada, situated in the central area of Bissau. Paper enlargements of the slides will be made according to a fixed scale in order to be scanned later on. Whether the quality will allow any overlay with a digitalized version of the cartographic maps or not. It is in fact the first attempt to elaborate a basic coverage.

Depending on the amount of work and the quality of the results, it will be assessed whether we should try to have access to the negatives of the aerial photographs made in Bissau by the French cooperation in the end of 1989 and to the recent cartographic updating of the photos made by the Dutch project-PMBB.

STEP 3

The elaboration of the database becomes important in this stage. There are two household surveys carried out in the neighbourhood of Reino-Gambeafada. One was carried out in the end of 1991, it has a total coverage and gathers information related to the building units and their occupants' identification and status. This information will be scrutinized in order to check whether it can be used for input and construction of a database.

At this moment important decisions will be made concerning data requirements, the need for field work and the searching for other

sources of data.

STEP 4

This step fundamentally deals with the decisions about the essential and minimum data necessary to build an USIS-Urban Spatial Information System.

Data about the infrastructure networks in principle do not demand field work since it can be acquired through maps and inquiries to institutions. The water, electricity and drainage networks are the most essential ones. It must cover its location and technical information such as diameter, length, pressure and capacity. Perhaps the year of construction/repair if it is available.

Data concerned with the social & economic conditions will certainly need field check and field collection work. This will be related to the occupants of the building units in the neighbourhood and will cover tenure status, households per unit, number of occupants, income, employment status, age groups, household expenditures, housing expenditures.

Data concerned with the physical conditions of the building units and the environment will also need updating and/or collection, although a lot of information can be generated from the aerial photographs and eventually from satellite photos. The size, quality of the building, type of roof, type of in-house infrastructure, problematic sites such as erosion, accumulation of trash, open sewerage and opportunity sites such as places for income generation activities, urban farming.

STEP 5

This step is mainly dealing with field work and data collection processes and eventually with some analytical exercises. A field work for collecting the necessary information will take place after assessing the results accomplished by the former steps. Whether the basic information we have at hand is worth to be taken into account for further complementation or should just be ignored. The involvement of Robert Kuunders at this stage will be desired.

STEP 6

After completion of field work it is expected that the automated environment for applying the tools will be developed in the forms of an USIS and digital maps. That implies the organization of the information, graphic and non-graphic data. This is a step that will be carried out jointly with Robert Kuunders.

STEP 7

Some proposals will be drawn up during this stage of the research. This stage can only be accomplished if steps 4, 5 and 6 have been completed. Both the graphic and the non-graphic databases will be operational for use. It will then be the time to develop and test a planning model in an automated environment, to analyze the results, the procedures, making comparisons, build scenarios, implement some cost-benefit analysis. By the time the research reaches this stage, it is expected that we are both customized with the software in order to develop appropriate tools according to the planning needs. The production of outputs and data presentation will be important at this stage.

STEP 8

Final assessment of the results will lead to a theoretical formulation around the integrated planning model. It is time to conclude the study.