

Public Participation in a Spatial Decision Support System for Participatory Planning

A. Fasihi, A. Mansourian and M. Taleai

Department of GIS, Faculty of Geodesy and Geomatics Engineering,
K.N. Toosi University of Technology, Tehran 1969715433, Iran

Abstract: The paper aims to develop a Web-based Spatial Decision Support System (Web-SDSS) to facilitate granting construction authority in local municipalities. A suitable method is suggested and evaluated to facilitate decision-making process in urban planning using spatial data and web-based Public Participation Geographical Information Systems (PPGIS). Although developing a GIS supporting urban planning for a governmental authority is a broad research area, there is a special focus on a module to support public participation through the capture of community feedback and other inputs. Utilization of Information and Communication Technologies (ICTs) to provide innovative means of access to urban plans as well as facilitating participation in urban planning activities is emphasized in the proposed method. A key feature of the proposed method relates to application of GIS via the Internet to share spatial data, planning issues and problem to the public. It has been shown how PPGIS can help to overcome some of the problems in traditional participatory planning.

Key words: E-Planning • Participatory planning • PPGIS • SDSS • WebGIS

INTRODUCTION

Planning is a future oriented activity, strongly conditioned by the past and present [1]. Ideally, it happens via public discourse between all groups and individuals interested in and affected by urban development and management activities pursued by the public or private sector. Today, one of the issues that increasingly searched from urban planners is the realization of participatory planning alongside of E-Planning to provide opportunities to the public at the base of participation. It makes an evolution in the existent top-down planning approaches to effective bottom-up method, with increasing the capabilities of planners in decision making, problem solving and analysis.

Unlike E-Government, E-Planning is not a well defined term. An intuitive understanding of the term has lead to confusion in definitions, which doesn't make it easy to communicate between planners about experiences and ideas about E-Planning. For instance, several experiences around the world claiming that had made the digital plan. Obviously, one can call a HTML-copy of the local municipality plan on the internet a digital plan, but there is more to it than that. On the basis of Larsen [2]

definition, Figure 1 is displayed E-Planning as an archetype could be placed in the DD quadrant (Digital plan and Digital planning).

Most of experiences are in an evolutionary phase and are therefore placed somewhere in the DA or AD quadrant. In like manner, urban planning in Iran at the best situation maybe can be placed in the DA quadrant, while Iranian urban plan made through a planning process supported by digital aid like GIS but there isn't any kind of public participation in this process.

PublicAccess planning service from Manchester city council is a suitable experiment that can be called E-Planning (DD quadrant). Citizens with the use of PublicAccess can view planning applications online, making comment and in summary mutually participatory planning will be occurred. (<http://www.publicaccess.manchester.gov.uk/publicaccess>).

Under such situation, different governments around the world have had particular attention to seek tools to establish the missing piece (public participation) of planning in order to enhance its analytical, problem solving and decision making capabilities.

More specifically, Iran as a populous and developing country with the traditional and bureaucratic urban

planning process has always faced with different problems, particularly tedious taking planning permission which takes the long time and cost from both citizens and local authorities with the minimum efficiency and satisfaction.

Therefore, urban planning in Iran needs to use and employ more of new ICT tools, innovations and concepts to improve the planning process and urban decision-making. While the most required information for urban planning having a spatial component, one of the important aspects is to employ and use more spatial information related technologies in order to improve decision-making and urban planning processes.

In this paper, after discussion about E-Participation concept, we examine potential of public participation techniques in Iranian urban planning system and investigate how new technology is being implemented with the aim of enabling increased levels of participation in the planning process. We suggest a participatory planning approach based on Web-based SDSS for utilizing in a development control process. A key aspect of the system is providing a two-way flow of information between the client (the general public) and the server (the local authority).

MATERIALS AND METHODS

Participation from the Gotze viewpoint is “a process in which individuals confront one another and adjust their wants and desires, thus creating, a common ordering of individual needs and wants into a single vision of the future in which all can share and thus, sharing the shell of outlook and perception” [3].

Different models in participation were developed; one of the first models that create is the Arnstein’s ladder of participation. Using Arnstein’s [4] classification, the lowest step of the ladder describes an utterly passive behavior and concerns public right to know, while the full interactivity occurs at the top of the ladder as the participation in decision making. Arnstein defined 8 stages leading towards full citizen control of the planning process which we illustrate in Figure 2.

Over the last thirty years, planners have tried to achieve public participation in planning and decision making, but in comparison with Arnstein’s Ladder at the best, they just obtained the level 3 of that ladder. To move up Arnstein’s Ladder we require a fundamental shift in the way we use communication in planning [5]. In Figure 3, devised by the scientists from Leeds city, the lowest step is passive supporting of information and the highest one

is systems supporting decisions working via the Internet [6-7].

Using of web based approaches in participatory planning is being simultaneous with governmental attempts to develop E-Government in numerous countries. Using of ICT in participatory planning in addition to change in data preparation methods, make changes in decision making methods based on consultation and participation.

E-Government and E-Planning: E-Government can be defined in narrow sense: “E-Government refers to the use of ICT to improve the efficiency, effectiveness, transparency and accountability of government” [9]. Also, in a broad definition “E-Government is the continuous optimization of service delivery, constituency participation and governance by transforming internal and external relationships through technology, the Internet and new media.” This includes Government to Citizen, Government to Business, and Government to Government [8-10].

A study in Iran estimated that over 70 percent of intra- and inter-city trips made by the people are for obtaining information, not services [11]. Therefore, developing an E-government and distance delivery of services will assuredly cut many kinds of expenses and save time and energy to an unbelievable extent. Iranian parliament approved the allocation of over 100 million dollars for the development of information and communication technologies (ICTs) to public organisations (March 2003 to March 2004). Henceforth, the cabinet ratified a detailed program for implementing several national information and communication projects. The program included projects in the fields of E-Government, E-Commerce, E-Banking, E-Learning, E-Health and E-Planning.

The term E-Planning is no different to E-Government apart from it focuses specifically on the planning domain. While the term E-Planning can encompass a broad range of functions here the focus is specifically on the use of E-Planning to assist and enhance participation in local planning.

More of research efforts over the past 10 years in around the world has mainly focused on the development of a range of technical tools to help support and implement E-Planning and the use of technology to enhance participatory processes [12-16]. These tools have mainly been GIS focused, although more recently a growing number of these have focused on 3-D visualizations [5]. To date much of the research has

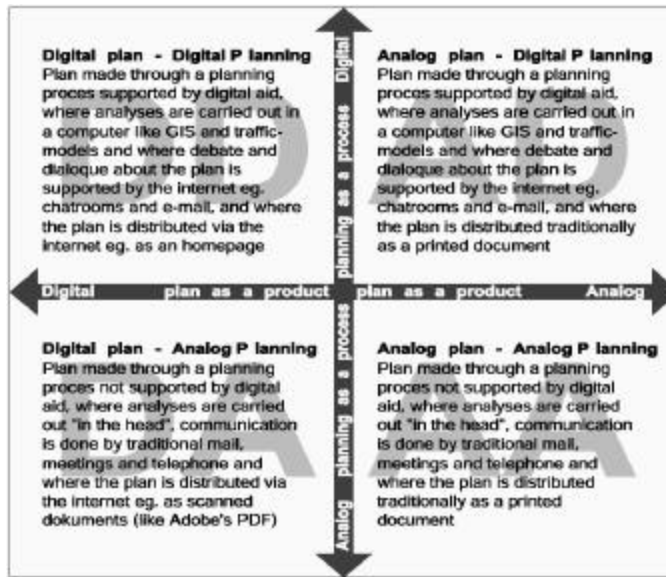


Fig. 1: 2-Dimensional conceptualization from E-Planning [2]

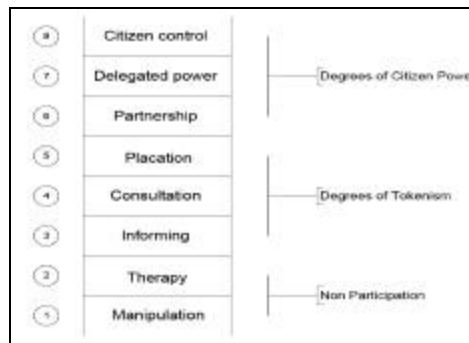


Fig. 2: Arnstein's ladder of participation [4]

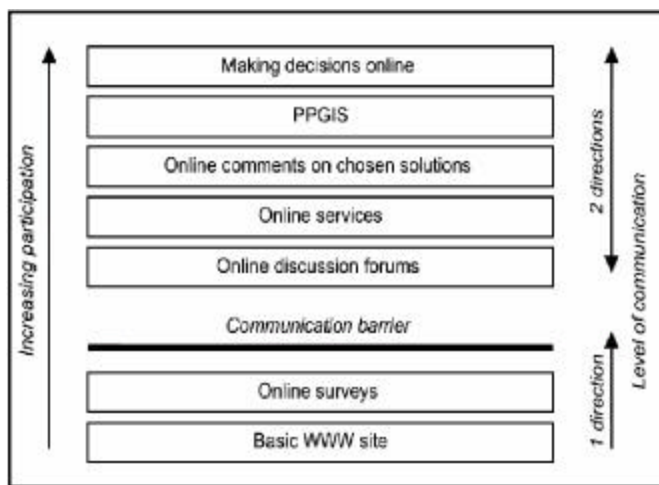


Fig. 3: E-Participation Ladder [8]

focused on the technical development of E-Planning systems, such as PPGIS and virtual environments.

Recent development in spatial information technologies provide new suitable and effective occasion for public participation in urban planning. Transparent, response and effective service delivery in E-Planning systems have an important role in comfortable access to information and in early communication with decision makers/planners and citizens.

Spatial Decision Support System (SDSS): Spatial decision support plays an increasing role in geographic information science since the beginning of the 1990s. Although researchers could not agree upon a definition of spatial decision support systems (SDSS) and on how to delimit SDSS from geographical information systems (GIS), SDSS are commonly considered as application-specific software solutions, and GIS are described as generators for SDSS [17].

The core function of an SDSS is to support users in solving complex, semi-structured decision problems [18]. Decision situations that have a spatial reference usually consist of a large number of decision alternatives with varying properties and, thus, are considered as being complex per se [19]. A decision problem is called semi-structured if it cannot be solved in a deterministic manner, but can be formalized to some extent. Differences in criterion importance weighting between stakeholders is a common factor that prevents a deterministic solution. The development of SDSS was initiated by advances in non-spatial decision support systems (DSS) in the management sciences in the 1970s [20].

Since the emergence of the World-Wide Web in the mid-1990s, both roots of SDSS and GIS have been related to Internet techniques and used for online applications. On the other hand, Peng and Tsou [21] and Green and Bossomaier [22] provided detailed overviews of Internet GIS techniques. Some of the most popular online geo-spatial applications, such as driving directions (e.g. MapQuest, URL: <http://www.mapquest.com>) and property databases (e.g. MLS, URL: <http://www.mls.ca>), combine features of Internet mapping and decision support. Therefore, research into Web-based SDSS (WebSDSS) seems a natural consequence. Rinner and Jankowski [23] describe technical foundations and applications of WebSDSS.

A common motivation for making SDSS accessible online is to support group decision making. Public participation through WebSDSS is promoted by Kingston *et al.* [15], Zhu *et al.* [24], and Sikder and Gangopadhyay [25].

With respect to E-Participation ladder in Fig. 3, at many cases, citizens' interaction with public bodies tends to be focused on stages 1 and 2, while with using of WebSDSS, the existing potential can moved into stage 7.

Related Experiment: It is recognized that there is burgeoning use of web-based approaches to public participation across the world. In a UK context there are two main methods in which the public become involved in the planning process. On one-hand we have *development control* which deals with the day-to-day processing of applications to the planning authority to obtain permission to develop land, building or make alterations to current developments. On the other hand, in terms of strategic planning this is mainly achieved through *the development plan*. Both of these elements of the planning system contain within them varying degrees of public participation. Within a planning context the most significant development in UK has been introducing of the Planning Portal (See: <http://www.planningportal.gov.uk/> last accessed February 2008). The Planning Portal is being promoted as the "one stop shop" for all planning information, providing access to planning application forms, development plans and facilitating planning applications and appeals tracking among its many services.

The Planning Portal will eventually give direct access to individual planning authority documents through one central point. It will provide access to development plans allowing anyone to view policies relevant to where they live, work or anywhere they are interest in through a Web-based GIS interface. It will be possible to apply for planning permission online and view planning applications on-line.

Virtual Slaithwaite is an model application for public participation in urban planning. Kingston *et al.* [15] aimed at increasing and improving citizen's involvement in planning processes by providing an online town map with the possibility of attaching notes to point locations in the planning area. These annotations are represented by points on the map so that subsequent users can view existing comments. Thus, decision support offered by this application consists of methods for visualization and communication of opinions on desired urban development.

In the Bronx area of New York, Silva *et al.* [26] describe a project used for asset evaluation and assessment. Both professional evaluators and community members collaborated on the collection of data and its presentation and analysis using maps as the medium. Inventory questionnaires and a series of indices were

used to measure the condition of properties, vacant lots, community gardens, greenery and where there was a presence of rubbish in the area. Again, the process involved lots of running feedback and revisions to include the full range of community concerns. The process integrated local knowledge into evaluation procedures with community feedback measures, revealing qualitative dimensions that statistical approaches failed to capture. Overall, the use of maps to tell a story gave insight, fostered collaboration, co-production and allowed non-technically inclined members to visualise and critique the results. The employment of this system made the final report a valuable product for the community.

The next piece of work to be studied has many similarities to that of the authors of this paper. It is the Woodberry Down project that began in 2000 in the London Borough of Hackney. Woodberry Down is described as “one of the biggest regeneration projects in Western Europe” [27].

The Centre for Advanced Spatial Analysis (CASA) was commissioned by the Woodberry Down Regeneration Team (WDRT) to develop an online method for participation. The resulting system has a strong emphasis on informing local residents about the redevelopment process, enabling visualization of different urban plans, promoting discussion and permitting votes on a variety of options over the web [28]. The WDRT reveals its belief in this process stating, “it is certain that when it comes to involving the local community in the regeneration, the quality of their involvement in the process may well be more important than the final outcome of many key decisions” [29].

In all these examples, the emphasis has been given to the use of the web and spatial information technologies such as SDSS and PPGIS to disseminate information in order to facilitate community awareness, promote discussion and provide vehicles for fully public participation.

IRANIAN URBAN PLANNING STUDY FROM PLANNING APPROVAL POINT

In current situation, local municipalities have authority to accept or reject requests for construction or reconstruction, based on available urban plans. Figure 4 illustrates the current process of development control. The requests need to be properly evaluated by the relevant decision making body.

Traditional methods in Iranian urban planning system have been criticized for several reasons. The primary methods of urban planning are always tedious processes

with the minimum efficiency and responsibility and without proper citizen participation in decision making.

With respect to spatial nature of most decision-making and planning issues in local planning councils such as municipality councils in Iranian Government, it's so obvious that employing and utilizing of perfect and reliable spatial information and related technologies will be very useful and is necessary in urban planning systems and spatial decision making processes.

Most urban decision-making problems are inherently spatial as Malczewski [30] said “it is estimated that 80% of data used by managers and decision makers are related geographically” related and regularly best represented using a GIS. Some of the recent attacks on GIS have been that they are complicated systems which require a high degree of knowledge to be able to use and understand them [30]. It is suggested that the use of integrated SDSS and ICT, and in particular web-based SDSS could help overcome some of the criticisms by creating a more level playing field on which a public debate could be conducted. The advent of these on-line technologies is beginning to have serious implications for the methods by which local government and democratic processes interact with citizens and how they participate in decision-making processes across the whole spectrum of public service delivery. Therefore, a shift from the conventional working procedures to a web-based SDSS based on participatory planning approaches can:

- Facilitate and enhance routine planning and development control processes,
- Provide easy access to hierarchical information about the decision problem,
- Improve communication among decision makers,
- Involving citizens' preferences on planning in a proper time, and
- Saving in money and energy by decreasing inner-city travel.

The potential role of WebSDSS within E-Planning should help to minimize conflicts and arrive at decisions that are acceptable to the majority of stakeholders through consensus building approaches based on awareness of the spatial implications of a decision problem.

RESULTS: PROPOSED WEB-BASED SDSS FOR IRANIAN URBAN PLANNING

After studying the failure of urban planning systems in Iran, some suitable related experiments, concept of

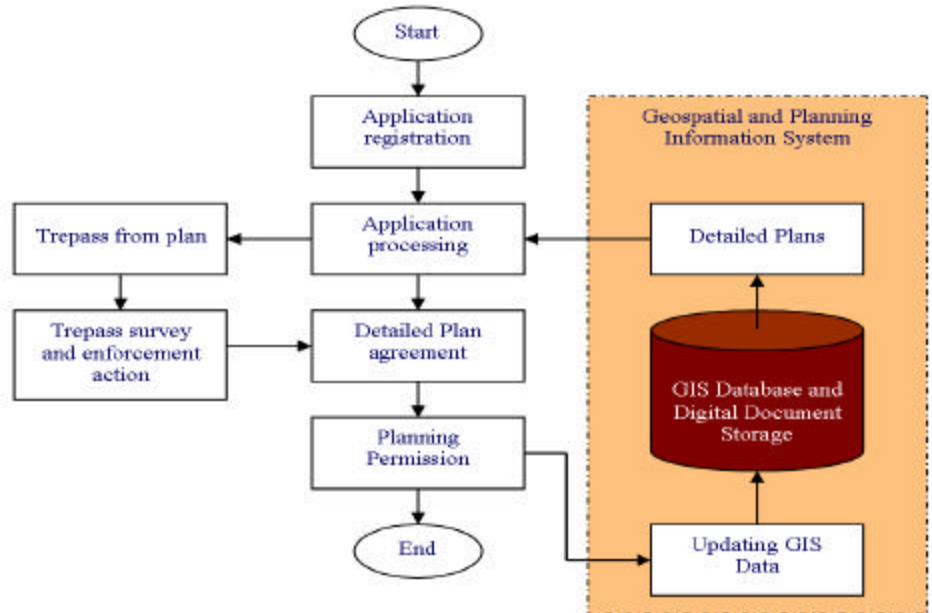


Fig. 4: The Traditional Process of Planning Development Control

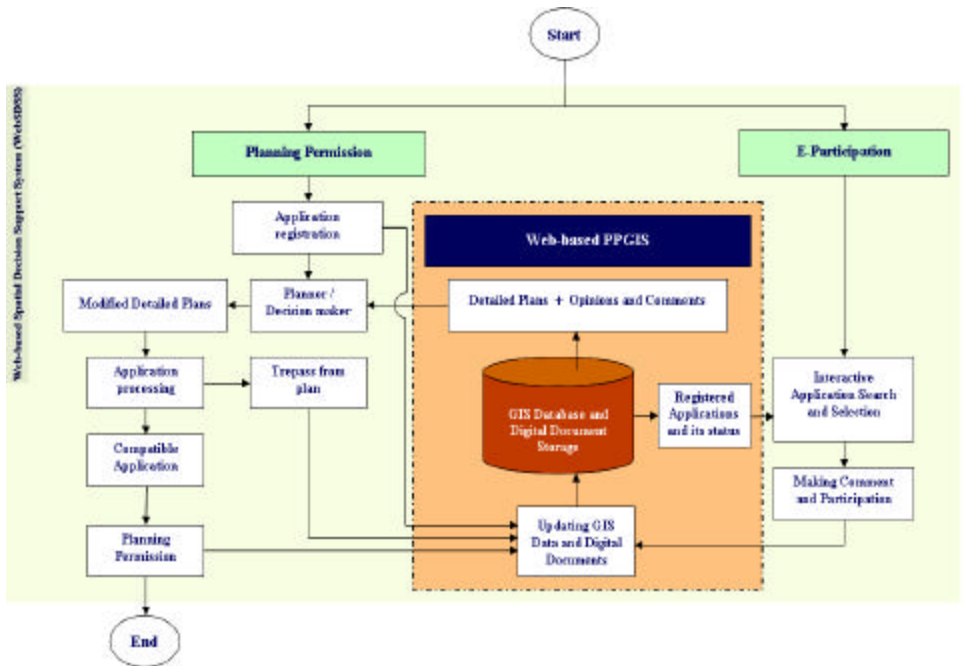


Fig. 5: Proposed prototype architecture of a Web-based SDSS for Participatory Planning in Development Control

E-Participation, E-Planning and SDSS, major necessity and advantages for implementing such problem solving system becomes clear.

In Iran, municipalities are principle proctor for urban planning and specifically development control activities. In fact, municipalities are dealing with enormous number of applications submitted by citizens to obtain permission to develop their own land and building or make some alterations. This is as a day-to-day and tedious process with the minimum efficiency and improper citizen participation in decision making.

As explained above, E-Participation can increase the success of urban planning as well as development control activities. Considering the spatial nature of city structure, utilizing Web-based SDSS and E-Government approach can support generation of PPGIS to facilitate implementing of an urban digital planning. The initial architecture of such a system is illustrated in Fig. 5.

Figure 5 demonstrates the structure of a web-based SDSS including two subsystems which execute specific functions while at the same time have interaction with each other. The proposed web-based SDSS is designed to incorporate the functions of online application registration, information dissemination, monitoring of application status, participation and consequently spatial decision making based on participatory planning approach.

Citizens can use the web-based SDSS for online registration of their planning application or E-participation on planning activities. At the planning permission unit, after online registration, the planning application will send to planner to take the decision. If the application was trespassed, the result and suggestions will be exposed to applicant by web-based SDSS.

Also citizens or stakeholders who interested to participate in planning process can search registered applications and make some comments at E-participation unit. Web-based PPGIS could be used by planners as a SDSS generator and reference point in evaluating of planning applications and E-Participation of citizens. Planners can use the system to update and modify primary urban detailed plan, based on registered applications as well as community feedbacks. The web-based PPGIS with the suitable tools for application registration, search and comment, can generate and support such processes.

For application tracking, applicant can refer to E-Participation unit and view the application status and planner suggestions, so one can make comments to coincide his request with modified detailed plans as well

as planners. This continues until the application will satisfy planners and detailed plan.

DISCUSSION AND CONCLUSION

Iran is a populous and developing country with the traditional and bureaucratic urban planning system which faces different problems. Such a system rarely support public participation in urban planning activities causing detailed plan to be inadequate and does not satisfy citizens' opinion. In spite of different activities have been done particularly after Iranian parliament approval for reducing the number of inter-city trips by utilizing E-Government concepts, current urban planning activities are not yet based on E-planning and public participatory approaches.

A Web-based SDSS for participatory planning in development control activities of urban planning, based on a PPGIS is proposed. Investigating the process of the proposed architecture shows that using Web-based SDSS in urban planning can facilitate:

- Access to information,
- Communication with planners,
- Participation of citizens in planning process, and
- Saving in time and cost by reducing the number of citizens' trips for registering and following their applications.

However, this is an ongoing research at K.N.Toosi university of technology and at next papers the result of implementing of the proposed Web-based SDSS at a case study in Mashhad municipality, will be presented.

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