

# A framework for designing PSS that allow for the integrated support of urban design, stakeholder management, and institutional management tasks

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## Abstract

To implement innovative social and technological solutions, planners cannot be exclusively concerned with designing alternatives for the physical transformation of an urban area. They must also account for the complex stakeholder as well as institutional regulations and procedures that can support or hinder the successful implementation of innovative solutions. Concerns about stakeholder objectives, values, demands, and positions as well as complex public processes, laws and regulations that need to be accounted for during the implementation of innovative urban solutions are moving to the center of urban planning practice. Numerous past projects have shown that the success of innovative urban transformation depends upon the ability of planners to integrate spatial design with stakeholder management and institutional management tasks. While planning support systems (PSS) can potentially be helpful during the implementation of such innovative urban transformations, still little is known about how to best link urban design support capabilities with functionality to support the management of stakeholders and public institutions. To overcome this gap, this paper presents use concepts to support the design of PSS platforms that can support more integrated urban design, stakeholder management, and institutional management tasks. The paper also illustrates how the use concepts can support the design of PSS by describing two PSS platforms which we developed to support German and Dutch municipalities with the implementation of innovative urban solutions.

*Keywords:* planning support systems, stakeholder management, institutional management

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## 1. Introduction

Planning support systems (PSS) are software consisting of a unique set of components that planners can utilize to support particular planning activities [4]. However, despite

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their promise to increase the productivity of planners, few systems are used in practice. Previous studies have attributed this gap between the theoretical potential of PSS and planning practice to general characteristics of PSS such as lack of flexibility, transparency, and simplicity [2].

While these problems are certainly important barriers to the uptake of PSS, this paper addresses yet another problem that hinders the widespread use of PSS. Because most available PSS systems are developed from existing GIS applications, their focus is mainly on supporting sketch planning activities [7, 5]. Planners, however, should no longer be solely concerned with "perceiving an area's imagined future and devising documents to describe it", but they also need both to actively engage with the existing stakeholders around a planning project and to shape and consult a project around existing public regulations and institutions [3]. However, most of the available PSS do not support the full range of planners' daily work tasks.

To overcome this issue, developers of PSS need to integrate functionality that allows planners to cope with stakeholder and public process management tasks. To this end, new use concepts for PSS are required that show how each of the different areas of the daily planning activities can be best integrated into PSS. This paper provides a first set of such use concepts and exemplarily shows how the use concepts, once implemented in PSS, could support planning activities.

The paper is structured as follows: In the next section, a short review of integrated planning theory is provided. This theoretical introduction is then followed by the set of use concepts that form the core of this paper. Then two short examples of how these use concepts could support planners are given from an ongoing project that the authors of this paper support. The paper closes by drawing brief contributions and providing some suggestions for future research.

## **2. Integrated planning support: Stakeholders, public regulations, and design**

The last number of years have seen exponential growth in the development of planning support systems. This growth is probably best documented in a number of edited handbooks [4, 1], but also can be clearly seen by the large number of existing commercial software and consultancy solutions available on the market. The relative importance and large potential of using these systems for participation is also widely documented [4]. However, despite the great potential identified by these studies, practical implementations on projects have also shown that such social-media based participatory planning support systems are complements to traditional public participation practice at best [6].

One reason for the at best complementary character is revealed by a closer look at the functionality of the existing systems. By large all, of them are designed to support participation around spatial information. We consider this characteristic, that probably can be explained by the evolution of many planning support systems out of spatial geographic information systems, as one of the shortcomings that hinder practical application.

This is because the transformation of an urban area, be it industrial or residential, should not be "simply concerned with perceiving an areas imagined future and devising documents

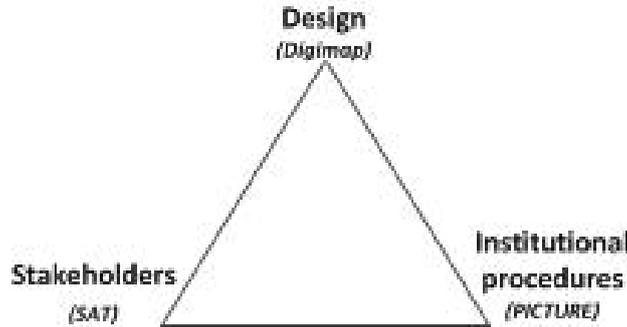


Figure 1: The three aspects of modern urban planning (loosely following [3]). The proposed research suggests to develop use concepts for social network applications that can support planners with accounting for all three aspects of the planning process.

to describe it” [3]. Urban planners should account for the existence of an organized civil society that expects that all planning efforts are transparent and democratic. In such contexts, planners need to implement procedures that allow for mutual and ongoing social learning processes between stakeholders about the real needs and prospects of a specific urban area. Such joint construction of knowledge requires planners to foster intensive interpersonal and group dynamics. Planning alternatives that account for the different needs of an area have to be developed together with the stakeholders. Each of the developed planning alternatives should then be discussed, justified, and compared in an open forum. To enable such democratic planning processes, involved stakeholders will need to gain not only a thorough understanding about the different ideas and alternatives for the spatial transformation of an area, but also about the existing institutional regulations and procedures as well as existing stakeholder networks and stakeholder objectives. Better yet, they should be empowered to actively get involved with shaping stakeholder networks, stakeholder objectives, and public regulations and procedures. The three aspects of developing ideas and alternatives for spatial urban transformation, stakeholder management, and public regulations all need to be the subject of social learning and participatory shaping efforts.

The existing tools, simply do not support all three aspects of urban planning. Systems usually exclude advanced functionality for stakeholder management and public process management despite the potential that social media has to enhance learning and co-production in these areas.

To improve this situation, it is important to develop concepts for how planners can best use PSS that account for all three aspects of Friedman’s notion of modern urban planning (Figure 1):

1. The use concepts need to support the development of PSS that can transparently communicate stakeholder networks and stakeholder objectives. Additionally, the use concepts need to support stakeholders to shape these networks and objectives in a participatory manner.
2. The use concepts need to support the development of PSS that support the transparent communication of public regulations and procedures as they relate to the involved

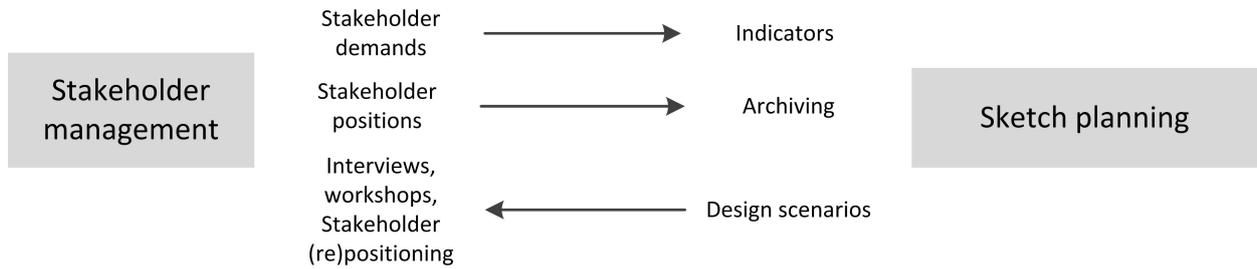


Figure 2: Information flow between stakeholder analysis activities and sketch planning activities.

stakeholders. To this end, the use concepts should not consider existing public regulations and procedures as stable. They should allow for involving the public in actively shaping existing regulations and procedures in the public domain. Through this focus the use concepts provide possibilities to allow adaptive governance in urban transformation projects.

3. Finally, the use concepts need to account for an integration of the stakeholder with public regulations and procedures. Stakeholders need to be actively involved in the design process, allowing them to provide suggestions, preferences, and wherever possible, solutions. The use concepts need to allow for the development of PSS that support the active engagement of stakeholders with shaping the transformation process by allowing for joint learning about existing public regulations and procedures in relation to specific spatial transformation alternatives and involved stakeholders.

The next section, provides a first set of use concepts along the discussion above that we developed in close collaboration with a number of municipalities, and small and medium enterprises in the German-Dutch border region.

### 3. Use concepts to support the design of planning support systems

#### 3.1. Use concepts for integrating design and stakeholder management activities

On every urban planning effort, there are many forums for communication (i.e. meetings, workshops, email correspondence etc.) where stakeholders come together and present, discuss or develop project visions and details. In these forums the representation of visions in the form of maps and the enhancement and simulation of ideas are vital elements for productive cooperation and ultimately for project success. In such settings sketch planning tools [7, 5] can serve multiple purposes in this process as a powerful tool for efficient communication and cooperation. Design scenarios from sketch planning tools can be presented to the stakeholders to be discussed, or sketch planning tools can also be used to show the effects of stakeholder issues on the project. However, it is important to integrate such sketch planning tools with stakeholder analysis methods [].

Figure 2 shows the key information flows between stakeholder analysis methods and sketch planning tools. Based on a first stakeholder scan (a first set of stakeholder interviews) using stakeholder analysis methods, objectives relevant to stakeholders, and therefore

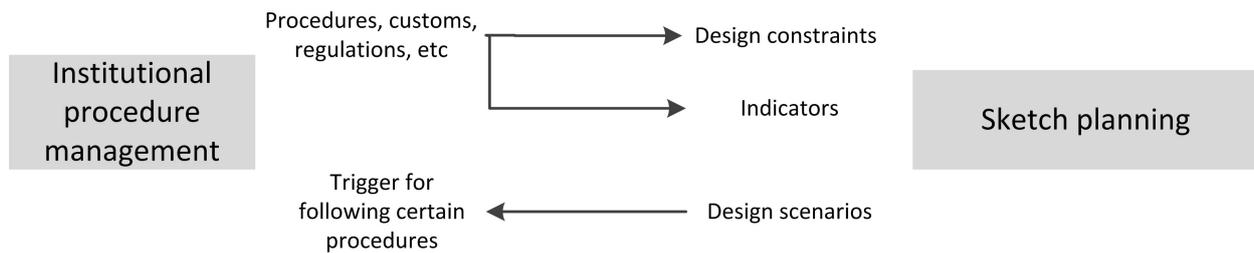


Figure 3: Information flow between public process management activities and sketch planning activities.

relevant to the project, can be identified for implementation as numerical indicators within sketch planning tools. This allows for the meaningful discussion of stakeholder interests and strategic project objectives. In this way, sketch planning tools can be used to develop scenarios represented by map visualization and displays that show scores on a set of indicators for scenario planning tasks, such as, number of jobs generated, sustainability, or knowledge exchange.

Scenarios created in sketch planning tools can then again support the communication among stakeholders by:

- Providing a medium for interactive planning in workshops or presentations using visualizations provided by sketch planning tools
- Giving stakeholders access to web 2.0 versions of sketch planning tools for ideation and preparation outside of meetings
- Providing visualization-based support for long-distance communication by means of screenshots and on-line scenario archiving.

Additionally, stakeholder interests can be mapped dynamically by using an archiving function that relates changing stakeholder positions and objectives to changes in design scenarios. Feedback of stakeholders regarding design proposals that consists of perceptions about and evaluations of specific scenarios can in turn be logged in stakeholder analysis tools.

### 3.2. Use concepts for integrating design and institutional process management activities

Institutional regulations and procedures place regulations and limitations on redevelopment options so that area development plans correspond to broader municipal policies. Documents like the land use plan contain critical information concerning the constraints and limiting factors that influence the planning process. Understanding the constraints on the use of land is essential in the discussion about possible uses for an area. Figure 3 summarizes the information flow between public process management activities and sketch planning activities.

One application for sketch planning tools to support design activities in the context of institutional regulations and procedures could be to present the current land use plan and

compare different scenarios for the revitalization of a specific area. Certain institutional aspects, building heights, pollution levels, or zoning, can be presented as information elements in the sketch planning tool for different possible design scenarios. Additionally, information concerning the consequences of design decisions on the planning process could be integrated. For example, the selection of a scenario for building a power plant instead of a recreation area may significantly influence the process duration resulting in project delays. Sketch planning tools could indicate these influences. It is also sensible not to introduce too many constraints in a sketch planning tool, as they might hinder the participants creativity by reducing the design solution space too much. From the perspective of design impacts on institutional regulations and procedures, planners must determine whether the given institutional regulations and procedures allow for the revitalization plans. For some revitalization possibilities, for example, changes to the land use plan are always possible if the merits justify the institutional effort.

In essence, design proposals will be generated using sketch planning tools. Part of the design constraints for these proposals will be derived from procedures like the land use plan and environmental impact regulations. These constraints can be built into sketch planning applications to set boundaries on the possibilities of developed future scenarios. When constraints are met or exceeded while making a new scenario or tweaking an existing one, users can be automatically warned. The user can then choose to change the design to stay within the constraint or try and change institutionally set boundary conditions by, for instance, changing the land use plan.

### *3.3. Use concepts for integrating public process management and stakeholder design activities*

Stakeholders and institutional regulations and procedures in any project are deeply interwoven and strongly linked. Processes are mostly described for public administrations, as they are predetermined by law. Consequently, relevant stakeholders are known for these processes, whereas for unwritten procedures it is more difficult to clearly identify involved people and groups, making those procedures more difficult to grasp.

On the one hand, existing public regulations prescribe specific stakeholder groups who are required during a specific planning activity and sketch the responsibility of these stakeholders. On the other hand, the existence or arrival of a new group of stakeholders can force planners to follow a different set of regulations. Figure 4 summarizes the information flows between these two planning activities.

To understand the interrelationship between stakeholders and institutional regulations and procedures, one can categorize the four most important stakeholder groups: public administration, non-governmental organizations, consumers/ consumer groups and companies. Formal tasks or process steps that each of these groups needs to follow are connected via information exchanges between stakeholders and can be visualized, for example, in swimlane diagrams. Such swimlane visualizations can then both act as a map through the project, answering questions such as *What are the next steps I have to take as a project leader?* or *As a concerned citizen, what possibilities do I have to influence the project?*, and visualize possible consequences in cases of stakeholder changes. With the visualization of an entire revitalization project at hand, the processes themselves indicate the responsibilities of

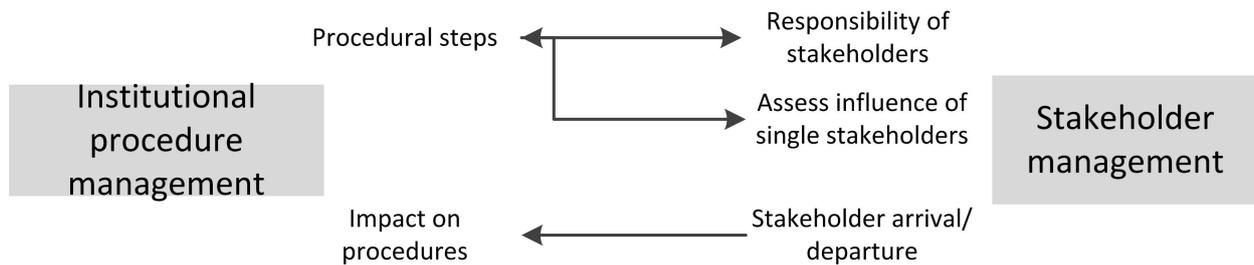


Figure 4: Information flow between public process management activities and stakeholder management activities.

the individual stakeholders, whereby more detailed procedure building blocks describe the necessary tasks for successful project completion step by step.

Mapping formal tasks and regulative procedures can also reveal the importance of certain documents, such as the land use plan, for a specific revitalization project. To determine the current state of integration between institutional regulations and procedures as well as stakeholders in a project, an integrated application could provide an electronic survey with questions such as, Is a change of land use plan necessary for your project? or Do you require an environmental impact analysis?. In this way help can be targeted to the project participants.

Summarizing, the formal mapping of regulations in relation to project stakeholders and the integration of these mapping efforts in PSS can provide an entry point for establishing relations to current institutional regulations and procedures and to understand how much is known among the relevant stakeholders about the important processes at a specific point in the project. Additionally, means for handling the current situation can be given, for example, by stating that a planning conference is necessary and suggesting ideal dates for such a conference.

#### 4. Illustrative example: Supporting conceptual planning activities in the German-Dutch border region

To illustrate how the above sketched use concepts can guide the implementation of PSS in a real planning context, we will describe how we supported the planning effort of the two municipalities of Winterswijk, The Netherlands and Vreden, Germany to develop a joint cross-border industry terrain. At the outset of this project, practitioners conducted a detailed stakeholder analysis, mapped important public regulations in formal process diagrams, and established a sketch planning application for the area. The two sections below illustrate then how these different aspects were combined into integrated planning support systems according to the use cases described above.

##### 4.1. Integrating stakeholder management and sketch planning

As a first step in integrating stakeholder management and sketch planning tasks, the most important stakeholder objectives for the transformation of the existing terrain were derived from the conducted stakeholder analysis:

- establish a good traffic connection to the industry terrain,
- develop the cross-border industry terrain as energetically sustainable as possible,
- allow for cross-border knowledge exchange between companies in Germany and the Netherlands, and
- open up new markets in the Netherlands, Germany, and the world for companies on both sides of the border.

These broad objectives were then developed in more detail during a workshop with a number of selected stakeholders. This workshop resulted in four more tangible indicators for the scenario:

- Capacity of the access routes to the area
- Zero Energy Balance
- Knowledge Exchange
- New Markets

These indicators were then implemented in a sketch planning tool. Thereafter, this sketch planning tool was applied within a second stakeholder workshop with the goal to evaluate the different developed indicators. After evaluation the workshop participants then developed possible sketch plans for physical configurations of the terrain that try to balance and maximize the different objectives with one another. These sketch plans were then evaluated according to their strengths, weaknesses, opportunities, and threats (SWOT). The sketch planning solution was then also made available to project stakeholders via the internet as a Web 2.0 application.

#### *4.2. Integrating stakeholder and public regulations*

For the same project, several regulatory processes as they are followed at the German municipality were mapped in detailed process schema. 5 shows an example of such a regulation - the process of changing the land use plan - in relation with different stakeholder groups that need to be involved at each of the steps of the procedure. Overall, this figure gives a clear overview of responsibilities during each of the steps. As such, this figure integrates well into the rest of the planning support system described in the previous subsection. Once the above described integrated sketch planning solution has helped the planners to develop a good solution for the transformation of the cross-border region, planners can use the developed swimlane diagram to start the required process of changing the land use plan on the German side.

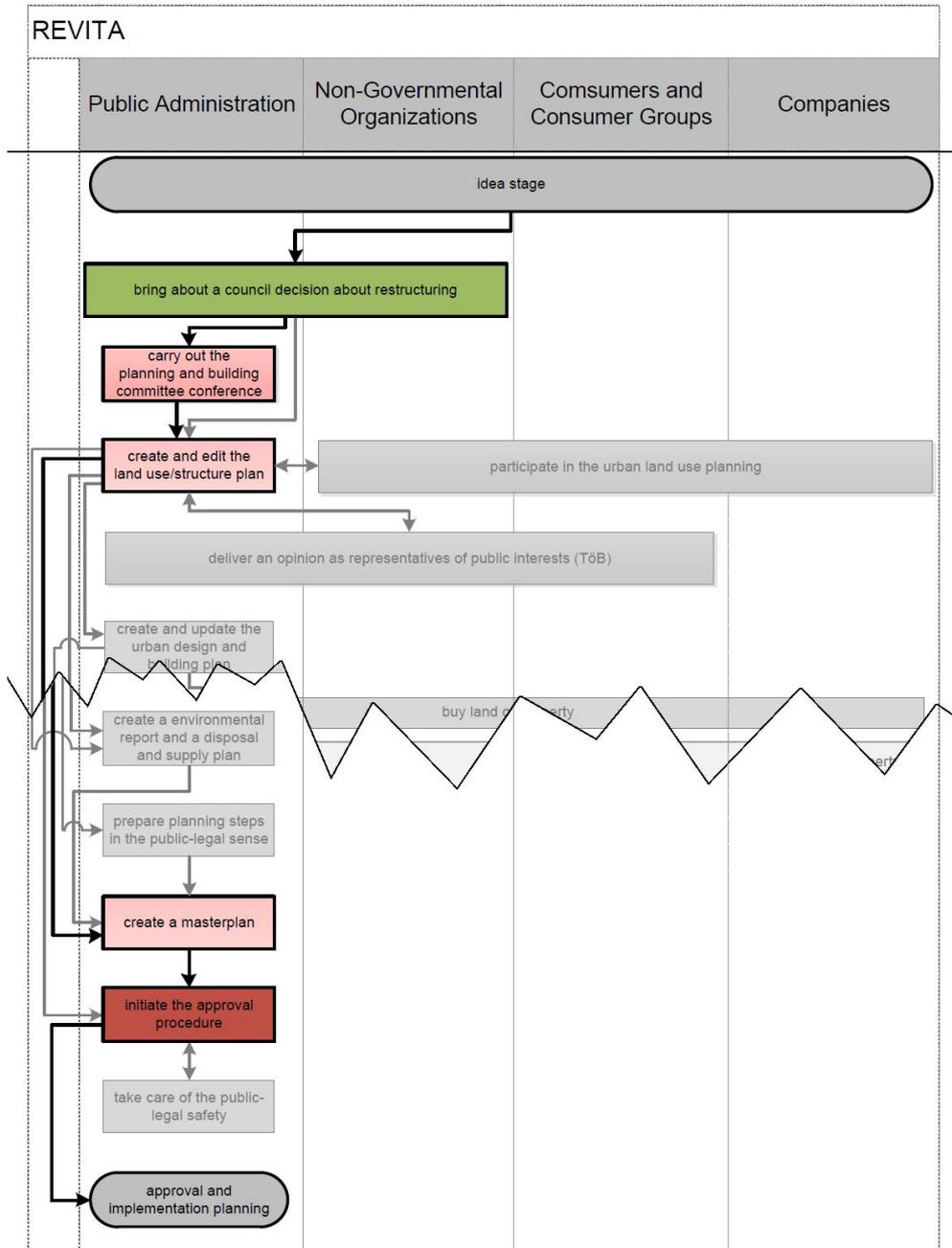


Figure 5: Example of a swim-lane diagram that links stakeholder management with the public regulations for land use planning. This swim-lane diagram maps each of the steps required according to the regulations and shows which party is responsible for the steps.

## 5. Conclusion

If nothing more, the paper suggests a number of initial use concepts for planning support systems that allow for the integration of sketch planning activities with stakeholder and public process planning activities. The use concepts can serve as design input for developers of PSS. As such we see the developed concepts as a first contribution for developing integrated PSS that truly support all work tasks of planners.

While we believe that the here presented use concepts can already meaningfully inform the development of PSS, the presented use concepts can only provide a first draft. Much research is required to refine the here presented use concepts and add additional ones to truly be able to guide integrated PSS development activities. Additionally, scientific research should validate the use concepts in much more detail than the research in this paper. The here presented validations are just examples and sound case studies need to be conducted that implement the use concepts on projects and track the benefits and shortcomings of the concepts in detail. We hope that this paper can provide a first stepping stone for such further research activities.

## 6. Acknowledgements

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