Management in the Built Environment
Faculty of Architecture and the Built Environment

AMSTERDAM INSTITUTE FOR
ADVANCED METROPOLITAN SOLUTIONS

Planning support systems in urban development in the Netherlands

MSc thesis reflection: Marije Schilder

COLOPHON

PLANNING SUPPORT SYSTEMS
IN URBAN DEVELOPMENT IN THE NETHERLANDS

MARIJE SCHILDER
Student number: 4003071
Email: marijeschilder@hotmail.com
Phone: +316 13 69 15 52
Address: E. du Perronlaan 474, 2624 ND Delft

DELFT UNIVERSITY OF TECHNOLOGY
Faculty: Architecture and the Built Environment
Master track: Management in the Built Environment
Graduation lab: Urban Development Management
Lab Coordinator: Dr. ir. E.W.T.M. Heurkens
Address: Julianalaan 134, 2628 BL Delft
PO box 5043, 2600 GA, Delft
Phone: +31 15 2789111
Website: www.bk.tudelft.nl

GRADUATION COMPANY
Name: AMS, Amsterdam Institute for Advanced Metropolitan Solutions
Address: Mauritskade 62, 1092 AD Amsterdam
Phone: +316 380 80 484
Website: www.ams-institute.org

MENTORS
First Mentor: Dr. ir. T.A. Daamen
Management in the Built Environment:
Urban Development Management
Second Mentor: Dr. ir. R. Binnekamp
Management in the Built Environment:
Real Estate Management

January 15, 2016

INTRODUCTION

This thesis focuses on the planning support systems (PSS) that are currently being applied in Dutch urban development practice. The use of PSS can support the complex urban development processes by giving insight into the urban processes by structuring and visualising spatial data, and also by supporting the communication and collaboration between stakeholders through interactive workshops. Nevertheless, after years of development, PSS are still scarcely applied in planning practice. One of the bottlenecks to its widespread use is the unfamiliarity of PSS to its potential users.

Therefore, the aim of this research is to increase our understanding of the constraints and benefits of planning support systems; to increase our comprehension of their role in the Dutch urban development processes; and to provide insights into the different factors that influence the perceived usefulness of these applications in the decision-making process in urban development in the Netherlands.

Next to a literature review, four case studies were executed using two different PSS: the MKP-MapTable of the Province of Utrecht and Urban Strategy of TNO. Additionally, the use of Tygron, Planmaat and Play the City is outlined based on semi-structured interviews with the developers to illustrate the broad variety of planning support systems. The results of these case studies have led to recommendations about the use of PSS in the urban redevelopment project Buiksloterham in Amsterdam. The outcomes are explained by using systems theory.

The case studies illustrate that it still takes much preparation time to adapt PSS to the specific spatial issue. Although PSS can be used individually, the application of PSS is especially suitable for complex, integral urban development processes that are characterised by open group decision-making. PSS process explicit knowledge that can determine the feasibility of a plan, while tacit knowledge can be shared during the workshop in order to determine the desirability of a plan. PSS are not able to visualise all the effects of urban development plans, due to the complex relationships between the different elements of urban development. Therefore, PSS advise stakeholders, but stakeholders do not have to abide by the result. PSS need to become more flexible in order to deal with the new insights of stakeholders during the planning process. In Buiksloterham, PSS are especially usefull in sharing information between different stakeholders in order to create a mutual understanding and a broad support on how Buiksloterham should be developed.

Keywords: Planning support systems (PSS); urban development; systems theory; decision-making processes; case studies.

VALIDATION OF THE RESEARCH TOPIC

PROBLEM STATEMENT

Despite the promising development of planning support systems from technology focused models towards participatory human-centred support, the application of planning support systems in practice is still lagging behind (Brail and Klosterman 2001; Geertman and Stillwell 2003; Uran and Janssen 2003; Couclelis 2005; Vonk 2006). Couclelis (2005, p. 1359) argues that this can be explained by the difference that planning is about policy, while the models are based on science.

Also Uran and Janssen (2003) identify the mismatch between the decision problem of end-users and the answers produced by the system as the main factor for this lack of success. A few years later, Geertman and Stillwell (2009) still confirm that it appears that after decades of development PSS were still not transparent enough, neither flexible nor user friendly and therefore incompatible with the unpredictable and flexible nature of most planning tasks and information needs.

Different authors mention that the major challenge in this area is to better link the decision-support tools to the ways in which stakeholders use these tools. Some reactions focus on improving PSS software by adding new functions to it; for example, PSS that are more integrated (i.e. 'What If' developed by Klosterman (1999)), more interactive (i.e. 'Urban Strategy' developed by TNO (2015a, 2015b)) or more user-friendly (i.e. 'UrbanSim' developed by Waddell (2002, 2011)). Others follow a more hardware-oriented path, such as 'MapTables', 'Sketchtables' and other visual gadgets.

Then, there is the process-oriented line that focuses on bridging the human gap between the potential end-users and the PSS developers with more participative, iterative PSS development structures (Te Brömmelstroet & Schrijnen, 2010), like the serious gaming tools. However, not much empirical research is done whether these recent developments have bridged the implementation gap between theory and their use in the practice of urban development.

SCIENTIFIC RELEVANCE

This thesis contributes to the scientific field of the use of planning support systems as:

- Empirical research often focuses on the tool instead of the process in which the tool is applied. Therefore, there has not yet been much empirical research about the performance of planning support systems made;
- Empirical findings are explained and evaluated through the lens of systems theory;
- The study is executed from a Dutch urban development point of view;
- The results of the comparative case analysis are immediately applied in an urban development project in Buiksloterham, Amsterdam-Noord.

PRACTICAL RELEVANCE

This study has a practical relevance, as the context of the application of planning support systems is very dynamic. New tools or improvements in planning support systems are developing rapidly, while the perspective on urban development processes is also continuously changing. This study therefore provides a contribution to the development of knowledge in relation to the current use of planning support systems in practice.
Additionally, the case studies evaluate in detail the planning support systems in its specific context. This supports the facilitators of planning support systems in improving the way their systems are used, and in gaining insights into the strengths and opportunities of their systems. Furthermore, the recommendations for the urban redevelopment in Buiksloterham will support the stakeholders in deciding whether to use or not use particular planning support systems in relation to their specific demands and the development stage of the proces.

RESEARCH OUTCOME UTILISATION RELEVANCE

The redevelopment project of Buiksloterham will be used to apply the findings of this research into the specific Dutch context of urban development, resulting in recommendations about the use of planning support systems in this particular case.

REFLECTION ON THE RESEARCH DESIGN

This research is based on a qualitative approach in order to clarify the complex context of the applications of planning support systems in urban development. The case studies describe this context. As every project is executed in a different context, multiple case studies were executed. By executing a comparative-case study the transferability of the findings is increased from one specific context to several. But most of all, this research design enables to discover patterns between different cases, similarities and differences, by which empirical findings can be further clarified. It is a comparative case study research design whereby different research methods will be used aligned to the different research sub-questions, like literature review, semi-structured interviewing, observations and secondary data analysis. The validation of the research methods is done according to Bryman (2012). Bryman (2012) distinguishes based on Lincoln and Guba (1985) four criteria in order to determine the quality of the research. In relation to qualitative research these criteria are indicated as the internal validity, external validity, reliability and objectivity. Internal validity is concerned with the question of whether a conclusion that incorporates a causal relationship between two or more variables holds water; External validity Is concerned with the question of whether the results of a study can be generalised beyond a specific research context; and reliability concerns with the question whether the results of the study are repeatable. As it is difficult to establish causal directions from resulting data, the internal validity of the comparative analysis of the case studies is typically weak. Therefore this research is related to other empirical studies and broadly accepted theories, like the soft systems approach. Furthermore, the research tasks are outlined in this thesis in order to increase the transparency of this research and thereby the possibility to replicate the study.

REFLECTION ON THE RESEARCH METHODS

REFLECTION ON THE LITERATURE REVIEW

The literature review is executed to generate an understanding of the topic and to be able to link the result findings to already established scientific knowledge. The literature review is, opposed to a systematic review, an example of a narrative review. The criteria for exclusion or inclusion of studies are less explicit in comparison to systematic reviews. However, as this research considers a complex context, which cannot be defined in fixed variables, it is hard to execute a systematic review. The narrative literature review enabled me to consider new literature during the research process, when I gained new insights into the topic. In this way, it supported experiential learning. I have used Excel to structure my sources on topic, relevance, and whether they have been read and summarised.

REFLECTION ON THE CASE STUDIES

Next to semi-structured interviews of developers, users and experts, the cases are supported by secondary data analysis and observation. By executing different research methods triangulation is achieved. Triangulation entails using more than one method or source of data in the study of social phenomena, resulting in greater findings as it enables crosschecking findings deriving from different research methods.

Reflection on the case sampling

Of all planning support systems available, the MapTable, Urban Strategy and Tygron were chosen as subject of study as (i) they are used in different urban development projects, on the scale of a neighbourhood; as (ii) they are comprehensive tools, taking into account a wide variety of indicators; as (iii) the tools involve stakeholder participation; as (iv) the working of the tools are clear allowing to compare different tools with each other; and, as (v) the tools are flexible and adaptable, by which they can be adapted to the specific situation of different development projects.

Due to the financial crisis, a limited amount of cases concerning urban development and using the MapTable, Urban Strategy and Tygron have been executed recently. Furthermore, many projects currently cover a smaller scale in comparison to projects executed before the financial crisis. Planning support systems are primarily used for large scale developments, by which the choice to execute case studies concerning recently used applications of planning support systems in Dutch urban development projects was very limited. Therefore, I also accepted to include projects like SUMP Tilburg, which has its focus on mobility issues instead of urban development. However, the application of planning support systems in mobility related projects are comparable to urban development projects, as in both cases many stakeholders with different backgrounds are involved, and as both types of projects aim to physically adapt a specific area to social-economic and spatial needs. Unfortunately no users of the serious games of Tygron consented to contribute to this research. Therefore, this case study is executed on the basis of semi-structured interviews with developers of Tygron and a secondary data analysis. This is further complemented by a semi-structured interview with Planmaat and Play the City. Planmaat is incorporated in this research as the interviewed developer has a great understanding of the use of different planning support systems in the Netherlands. This interview contributes to this research with respect to the use of planning support systems in urban development in general. The decision to involve Play the City is made at a later stage of the research, as I discovered that Play the City was planning a game workshop for the stakeholders of Buiksloterham during researching the redevelopment Buiksloterham. Attending the Buiksloterham City Innovation gaming session was of great value to gain a greater insight into the possibilities of applying PSS in Buiksloterham.

Requirements for the case studies were that (i) they have been executed recently applying the last developments of planning support systems; that (ii) the workshops have been completed in order to execute ex post evaluation enabling to evaluate the results and perceived effects of the planning support systems; that (iii) the PSS developers could put me in contact with the project-related users; and (iv) that the PSS has been used in the Dutch context of decision-making and urban development. It turned out that the different cases were very complementary to each other. For both the MKP-MapTable and Urban Strategy, one positive case and one less positive case were conducted.

The cases were conducted on different moments in the planning process enabling to reveal a wide variety of planning tasks supported by the planning support systems in its practical context. The amount of cases are determined by practical considerations in order to be able to validate the assumptions based on a variety of cases, while the amount of cases is limited due to time constraints.

Reflection on the interviews

The semi-structured interviews are used to gain information of the individual, personal experiences and opinions from the developers, users and experts. During the interviews the interviewee is motivated to share their perspectives. The interview formats of the PSS developers and PSS users are shown in appendix B and C. These formats are based on the literature review, whereby attention is paid to the context of the cases accordingly to the soft systems approach. The results therefore need to be interpreted in the context of the case studies. The semi-structured interviews allowed flexibility to explore the different aspects influencing the use of planning support systems in practice and to zoom in on specific issues of relevance. Therefore more precise assumptions regarding to the aspects influencing the use of planning support systems and the perceived effectiveness of its users. The procedures of executing the interviews are outlined to improve the transparency and reliability of this research.

A total of 15 users were being interviewed for the four cases, which is further supported with 8 interviews of PSS experts and developers. An overview of the interviewees is shown in appendix A. The interviews lasted 30 to 75 minutes. The interviews with the users in general lasted shorter than the interviews with the developers, as the interviews with the developers were conducted first. During these first interviews, general information was gained about the cases, which saved time in the other interviews later on. The interviews are transcribed verbatim, and checked and approved by the interviewees. Amongst the PSS users different disciplines participated in this study. For the MapTable case studies civil servants from various domains from the two municipalities were interviewed, like a consultant Infrastructure, consultants Environment, and the municipal project leaders. Furthermore, the urban planner gave interesting insights from his perspective. For the Urban Strategy case the project leaders of TNO were interviewed, civil servants of the Municipality Tilburg, an urban designer for Healthy Urbanisation Utrecht and a representative of Rijkswaterstaat.

Additionally, to the interviews, I have received a demonstration of every tool to experience the possibilities of the tool by myself. As the workshops were not attended and observed by the researcher, because of limited time to execute this research, one can only argue that this research delivers assumptions about the perceived usefulness of planning support systems by its developers and users.

Reflection on primary and secondary data analysis

To further support the results of the case studies a secondary and primary analysis of data is executed. The primary analysis of data concerns the transcriptions of the interviews, while the secondary analysis of data concerns documents of the Province of Utrecht and TNO. These documents cover information about the projects and about technical information about the planning support systems. Some of this data is included in the appendices. The reliability of the data of the Province of Utrecht and TNO is considered to be high as they have expert knowledge about their own tools, direct contact with the end-users and as they facilitate the workshops with the planning support systems. The verbatim-transcribed interviews offer a transparent foundation to analyse the findings.

REFLECTION ON THE COMPARATIVE CASE STUDY ANALYSIS

A drawback of executing case studies is that the researcher cannot manipulate any of the variables influencing the use and perceived effectiveness of planning support systems in practice. Therefore, there exist some ambiguity about the relationships between variables discovered during the analysis of the different case studies. To limit this ambiguity, the comparative case analysis is based upon an evaluation framework resulting from the literature review and theoretical framework. This enabled connecting the empirical findings to other scientific sources to improve the validity of the assumptions. Furthermore, expert interviews were executed to validate and test the findings. The evaluation framework relates six planning tasks that are performed by PSS to three different types of PSS and three phases of the development process. However, Urban Strategy, MKP-MapTable and Tygron appear to cover all three functions. One can therefore wonder if this distinction is useful in order to classify planning support systems. I think however, that the level of support in these three functions differs between different PSS.
Also, earlier developed PSS did not always cover all the different PSS functions. Linear Programming is for instance an evaluation tool, which does not cover drawing and simulation functions. In the end the distinction of different planning tasks appears especially relevant in recognising different types of interaction between the stakeholders, enabling to characterise different types of learning.

REFLECTION ON BUIKSLOTERHAM

The use case was chosen to apply my findings directly into practice to increase the utilisation potential of this research. Buiksloterham was chosen, as it is an innovative sustainable project. These types of projects are typically open towards new innovations like the use of planning support systems. The complexity of this transformation project supported the need for such a PSS: due to the bottom-up, organic approach, many stakeholders are involved in an unstructured way; Furthermore, the contaminated soil and the environmental impact of residual industry together with the high sustainable ambitions increases the complexity of the project as well. Additionally, the large amount of involved actors enabled to research the many different perspectives and demands for information related to those different stakeholders. Also the timing of the case made it suitable to be used to apply the findings: the timespan of the project runs from 2005 to 2030. This means that the project is in its initiation phase whereby decision-making still plays a major role in the process. The practical reason that Buiksloterham is chosen is that it could be executed in collaboration with AMS, Amsterdam Institute for Advanced Metropolitan Solutions. The case study is related to the theoretical framework and literature review, just as the urban development process characteristics of the PSS cases. The case study is validated by semi-structured interviews, observations, and data analysis. The semi-structured interviews covered three persons related to the redevelopment of Buiksloterham. As many actors are involved, one cannot argue that these perspectives correspond to the perspectives of all involved actors. Also, as the redevelopment of Buiksloterham consists of many different subprojects, it might be the case that in some subprojects the application of the PSS would be more suitable than in others. However, the urban redevelopment of Buiksloterham is in this research used to illustrate how the recommendations and assumptions of the case studies can be applied in practice, and aims not to analyse the development into great detail. The observations were based on a game session of the City Innovation Game of Play the City.

EVALUATION OF THE RESEARCH PROCESS

As mentioned in the preface, I started this research by studying smart city developments and the way in which data can be used in the decision-making process in urban development. Soon, I discovered that it was difficult to execute case studies in the Netherlands related to that topic, as holistic approaches to the smart city concept were not realised yet. Therefore, I am very glad that I have changed my topic of research towards planning support systems, by which I could relate my findings to the Dutch practice of urban development. However, much time was lost in researching smart city approaches and eventually I delayed the approval of my research proposal in order to create a concise and consistent proposal for the next P2 possibility. During the subsequent semester, I spent a lot of time to the literature review, starting with a background in GIS technologies and spatial decision support systems.

The abundance of literature related to the tool-specific details has led to an understanding in the limitations and developments in GIS and related GPS and multi-criteria decision-making technologies. However, these topics were not crucial to my research. Consequently, I have lost much time in reading scientific articles. As students are supported to work independently on their research, I continued to keep reading until the next P2 moment. In retrospect, I should have got more often in contact with my mentor to better keep on track.

As my former second mentor has received a new job at the same research lab as my first mentor, it I needed to search for a new second mentor. Luckily, my first mentor helped me to get in touch with Ruud. With a new direction in my research and a new second mentor I was resolute to finish this graduation research in a new way. I tried to consult my mentors more often and with the approval of my research proposal I could finally execute the research. In the end it turned out that my mentors had both different perspectives on systems theory. Although it took me some extra time to internalise systems theory, it balanced my view on the subject well and enabled me to structure the issues and complexity of urban development processes. Therefore, I am glad that I decided to use this theory in my research.

I have learnt a lot from executing this research, but I am glad that I am almost finished. This research project was by far the most difficult project I needed to accomplish during my studies in Delft. I found it quite difficult to work totally individually at a project, as I prefer to collaborate with other people. I especially missed to have a common goal and to share the highs and lows of the research project with fellow students. Also, I have regretted that this research is quite theoretical. Although, I have executed case studies and have been in contact with many practitioners, I prefer to work in a more solution-oriented way. However, by executing this research, I have learnt more about myself, and about what I want to do and not want do after my graduation. Therefore, I look forward to the new challenges that lie ahead.