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Performance of Planning Support Systems What is it, and how do we report on it?

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ABSTRACT

Planning Support Systems (PSSs) are a family of computer based instruments specifically designed to support actors in their complex tasks in the field of planning. There is a gap between the high expectations that PSS developers have about the usefulness of their instruments and the instruments' application in daily planning practice. PSS academics have proposed several ways to close this so-called implementation gap through a range of software, hardware and orgware approaches. Several of these approaches have been applied in practical planning settings. There is however a lack of consistent and structured reporting on the effectiveness of these approaches in improving PSS performance. Therefore, it is hard to distinguish between successful and less successful strategies, and it is difficult to draw overall lessons. This paper (1) proposes a comprehensive multidimensional framework that operationalizes PSS performance, and (2) analyses how recent PSS implementation studies have reported on this performance. The developed framework, based on literature from Group Model Building and group psychology, is sensitive to a wide variety of performance dimensions and therefore forms a useful guideline for assessing PSS implementation strategies. Studying these in a common framework supports the potential transfer of lessons to other PSS implementations. Most of the analyzed studies only posed hypotheses about which dimensions are improved through a specific strategy, but did not report on measuring impacts. By structurally measuring the effectiveness of a range of strategies to improve PSS implementation, lessons can be exchanged and a consistent body of knowledge can be built.

1. Introduction

Urban strategy making is an increasingly complex endeavour. As Couclelis elegantly describes,

> *'[i]t involves actions taken by some to affect the use of land controlled by others, following decisions taken by third parties based on values not shared by all concerned, regarding issues no one fully comprehends, in an attempt to guide events and processes that very likely will not unfold in the time, place, and manner anticipated'* (Couclelis, 2005, p. 1355).

Clearly, involved planners and actors should embrace all the help they can get to deal with this complexity. Planning Support Systems (PSSs) is a field that attempts to offer such support. It is a new member of a family of computer aid for planners and is closely related to the fields of Large Scale Urban Models and Spatial Decision Support Systems. There are many definitions of what PSS is, ranging from very broad to very narrow. Following Klosterman (1997) I choose to broadly define PSS as "*any kind of infrastructure which systematically introduces relevant (spatial) information to a specific process of related planning actions*" (Te Brömmelstroet, 2010, p. 28). In Section 2, this definition is more thoroughly discussed. Within the PSS field, scholars and professionals have developed a wide variety of applications that attempt to support all kinds of planning actions, from highly strategic to operational. Sometimes these applications offer very specific support for particular planning steps, while others are much more generic. Nevertheless, they all share a common goal—improving planning.

Based on the description above one could expect that these PSS enjoy a warm welcome as vital support in the strategy-making jungle. This is however hardly the case. On the contrary, time and time again PSS scholars find a persistent gap between the developed applications and their use in planning practice (as found in Lee (1973), Te Brömmelstroet (2010) and Vonk, Geertman, and Schot (2005)). The reasons for this implementation gap are numerous. Their potential users see PSS as inadequate, far too generic, complex, too technology oriented (rather than problem oriented), not transparent enough, neither flexible nor user friendly, too narrowly focused on strict technical rationality, and incompatible with the unpredictable/flexible nature of most planning tasks and information needs (see Batty, 2003; Bishop, 1998; Couclelis, 1989;

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Geertman & Stillwell, 2003a; Harris & Batty, 1993; Lee, 1973, 1994; Sieber, 2000; Uran & Janssen, 2003; Vonk, 2006). Referring to Harris (1999), Geertman adds to this that '*planners and designers have remained at best distrustful, or at worst downright antagonistic, towards [PSS]*' (2006, p. 863).

There is no shortage of ideas and concepts to bridge this implementation gap. Some of these 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 (2011)) 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 (see Vonk & Ligtenberg, 2009). 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).

In the light of design science (as opposed to explanatory science see Straatemeier, Bertolini, Te Brömmelstroet, & Hoetjes, 2010, pp. 578–579), understanding the problem and proposing theoretical grounded solutions *'is only halfway to solving it'* (Van Aken, 2004, p. 220). Following Van Aken, I argue here that in if academics want to address field problems, they need to engage in both problem definition and solution testing. Such testing involves typical key questions. These questions are different from traditional research questions. What is the goal of the potential solution, and how does it score on that goal? What kind of mechanisms work (or do not work), why do they work (or do not work) and in which contexts? How can different mechanisms be linked and will that create synergy?

A number of PSS scholars have recently called for such a change towards more design oriented research. In 2001, Shiffer (2001, p. 384) asked: '*How can we evaluate the effects of [PSS] in public environments? How does it change the nature of community-related conversations?*' More recently, Van Delden and Hagen-Zanker (2009, p. 366) repeated these questions by asking: '*How to support today's policy making based on what is learned from [PSS]? How can we measure if an added value is provided to the policy-making practice?*' In the same edited volume, these questions are summarized by Pelizarro, Arentze, and Timmermans (2009, p. 06): '*To ensure optimal performance, usability testing must be addressed in future research*'. Allen articulated this by stating:

> '*To help prospective users sort through tool choices, rigorous evaluation of tool capabilities and performance is needed. Such a service, performed by a qualified academic or nonprofit professional group, could accelerate tool adoption by reducing uncertainties and risks that new users face when selecting tools and encouraging tool developers to pursue best practices*' (Allen, 2008, p. 166).

This paper attempts to offer some initial steps into understanding how the PSS domain can move into the necessary phase of testing their proposed solutions to the PSS implementation gap. To do so, I will answer two research questions. The first is formulated as: *What is the general goal of PSS development and implementation, and how can this be operationalized*? This is answered through a literature study on the definition of what a PSS is considered to be, followed by assessing how this can be translated into measurable dimensions. The second part is done by using insights from adjacent academic fields. The second research question is: *How do recent PSS studies report on hypothesizing and measuring the performance of their implementation on this general goal*? Using a taxonomy of three types of PSS, as developed by Vonk (2006), a wide selection of recent PSS implementation studies are analyzed. This analysis attempts to form a starting point and should be interpreted as an explorative first overview of the state of the PSS field. Following the conclusions from this analysis, I close the paper with discussing what this means for the PSS domain and propose possible ways forward.

2. Goals of PSS for strategy making

2.1. What do PSS aim to improve?

Without covering the entire debate about what constitutes good planning, in this section I attempt to distil some common denominators of what we strive for as PSS developers when we claim to *improve planning*. I will start by looking at the statements and definitions of PSS made by leading authors in this field.

In their 2004 inventory, Geertman and Stillwell state that PSS show an enormous variety of goals: 'to facilitate and/or enhance participation by the public and/or of stakeholders in the planning process; [...] to support specific tasks within planning processes; [...] to inform the public about different planning and policy topics in their region or country; and [to] support specific forms of planning by practitioners' (2004, p. 295). They specifically address the divide between PSS for strategic planning and those for operational planning.

In discussing the definition of Planning Support Systems, Klosterman (1997, p. 51) opts for a more general goal: 'PSS should be designed to provide interactive, integrative, and participatory procedures for dealing with non-routine, poorly structured decisions [and to] pay particular attention to long-range problems and strategic issues and explicitly facilitate group interaction and discussion'. On the same page, he adds that PSS can be seen 'as providing the information infrastructure for planning that facilitates interaction among planners, and between planners and other actors' [emphasis in original]. He goes on by saying that PSS aim to 'support a continuous and interactive process of analysis, design, and evaluation that constantly integrates new information generated as model-produced analytical results redefine design issues and the elaboration of design issues generates new demands for analytical information'. Geertman (2006, pp. 863–864) offers a more concrete view on these goals, by viewing that PSS aim to provide 'dedicated information, knowledge, and instruments [...] to enlighten (that is, make faster, improve quality, increase ease of performance, etc.) [...] planning tasks and activities'.

It seems that the goal of PSS is twofold (and mirrors debates in planning theory). First, PSS aim to improve planning *processes* by structuring them better and/or making them more interactive, integrative and participatory, etc. Next to that PSS aim to improve the *outcomes* of these processes (e.g., strategies, plans and projects) by providing relevant knowledge and facilitating a design-analysis loop that improves the link between explicit knowledge and planning actions.

2.2. Why are strategic planning phases important?

In this paper I explicitly focus on PSS that aim to support strategic planning phases. This is done, because the link between knowledge and planning actions is relatively straightforward in operational planning, where concrete and well-defined projects have to be assessed. Often, the process itself is highly standardized. Here, the use of PSS is relatively successful as shown for Cost Benefit Analysis by Geerlings and De Jong (2003) and transportation models by Timmermans and Arentze (2011). But this can hardly be said about the more strategic planning phases, where often both planning goals and means (and their relations) are uncertain and not agreed upon (Christensen, 1985). Strategic planning often is about 'wicked problems' (Rittel & Webber, 1984), for which there