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A comparison of the perceived added value of PSS applications in group settings

Peter Pelzer [a,*], Stan Geertman [b], Rob van der Heijden [c]

[a] Utrecht University, Copernicus Institute of Sustainable Development, the Netherlands
[b] Utrecht University, Department of Human Geography and Spatial Planning, the Netherlands
[c] Radboud University Nijmegen, Nijmegen School of Management, the Netherlands

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ABSTRACT

Research on planning support systems (PSS) is increasingly paying attention to the added value that PSS applications have for planning practice. Whereas early studies tended to have a rather conceptual focus, recent studies have paid more attention to empirics. Although this is a step forward, there is still a notable gap in the literature: a dearth of empirical evaluations of PSS applications from a comparative perspective. This paper addresses this gap, based on an earlier published conceptual framework that identifies the potential added values of PSS applications. The paper also tentatively explores the effect of three explanatory factors: support capabilities of the PSS, usability, and the context. In doing so, it reports on research of four PSS applications in The Netherlands. The research method consisted of questionnaires completed directly after the session, open interviews and conversations with stakeholders, and observations. With regard to added value as perceived by the participants, the findings indicate that learning, both about the object and about others, was a key perceived added value in all four cases, despite differences in context, support capabilities and usability scores. Moreover, although usability perceptions of the PSS applications varied, overall they were relatively positive. Context appears to have a substantial effect on the perceived added value of the PSS application, making it hard to distil the exact effect of the support capabilities and usability perceptions. The effect of context is one of the topics that could be picked up in further studies into the added value of PSS. One way to accomplish this in future research is by comparing a larger number of different PSS applications in different contexts, resulting in a higher n in order to enable correlational analyses and cross-national comparisons to better grasp the influence of the institutional context.

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1. Introduction

Planning support systems (PSS) are 'geo-information technology-based instruments that incorporate a suite of components that collectively support some specific parts of a *unique professional planning task*' (Geertman, 2008, p. 217 — emphasis in original). Early studies mainly focused on instrumental characteristics (Brail & Klosterman, 2001; Geertman & Stillwell, 2004, 2009), sometimes complemented by theoretical accounts (e.g. Klosterman, 1997). The last two decades, however, have seen the development of the first contours of a 'PSScience' (Geertman, 2013),[1] in which the interrelationships of the concepts in the term PSS – planning, support and systems – are studied in more depth. Two important developments can be discerned within this emerging body of research.

Firstly, there is now a fairly rich set of articles embedding PSS within the wider debates on planning theory, such as the advent of communicative planning (Batty, 2008; Couclelis, 2005; Geertman, 2006; Guhathakurta, 2002; Pelzer, Geertman, & van der Heijden, 2015. Secondly, more empirical research is being conducted into PSS applications (Arciniegas, Janssen, & Rietveld, 2013; Goodspeed, 2013; Nyerges, Jankowski, Tuthill, & Ramsey, 2006; Pelzer, Geertman, van der Heijden, & Rouwette, 2014; Pettit, Raymond, Bryan, & Lewis, 2011; te Brömmelstroet, 2014). These studies apply such research methods as observation, questionnaires and interviews to gain a better insight into how users perceive and use PSS, which might lead to ways to improve the PSS and/or its application.

The central dependent variable in most of these studies is the added value a PSS application has for planning practice. Earlier empirical studies used varying conceptions of added value, including learning (Goodspeed, 2013), effectiveness (Arciniegas et al., 2013) or frameworks that include multiple dimensions (Pelzer et al., 2014; te Brömmelstroet, 2014). The studies in the emerging field of PSScience have three gaps. Firstly, several of the empirical studies that are taking place are based on experiments with students (e.g. Arciniegas et al., 2013; te Brömmelstroet, 2014). While this allows for in-depth study in a controlled setting, it leads to issues of external validity: the question is whether a planning workshop with students reflects real-world

* Corresponding author at: Copernicus Institute of Sustainable Development, Utrecht University, Post: P.O. Box 80115, NL-3508TC, Utrecht. Tel.: +31 30 2536771.
E-mail address: p.pelzer@uu.nl (P. Pelzer).

[1] Geertman (2013) draws an analogy with the notion of GIScience (e.g. Goodchild, 2006), which was used to distinguish research within GIS from research about GIS.

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planning practice to a sufficient degree. Secondly, and partly related to external validity, almost all of these studies are single case studies, which makes it hard to generalize their findings to other instances in which a PSS was applied. Thirdly, in the case of the comparisons of different PSS applications, the analysis tends to be at a conceptual level (Geertman & Stillwell, 2004) or be based on an interpretation of earlier studies (te Brömmelstroet, 2013), rather than on primary empirical data.

This paper fills these three gaps by answering the research question: what is the perceived added value of different kinds of PSS application according to practitioners? In answering this question, we use the following definition of added value: 'a positive improvement of planning practice, in comparison to a situation in which no PSS is applied' (Pelzer et al., 2014, p. 16). From that perspective, this paper focuses on the added value as perceived by practitioners. Here, it is important to underline that this paper focuses particularly on group settings in which a PSS is applied, which is in line with the importance of collaboration and communication in contemporary planning. As Klosterman (1997, p. 51) pointed out: 'planning support systems should facilitate collective design — social interaction, interpersonal communication and community debate that attempts to achieve collective goals and deals with common concerns.' The focus on PSS in group decision settings applies to both the conceptual framing and the empirical results presented in this paper.

The paper is structured as follows. Section 2 presents a conceptual framework and a categorization of added value dimensions, and identifies potential explanatory factors. Section 3 describes the case selection and the research methods. Section 4 presents the main findings from the four cases, after which Section 5 reflects on the most important findings. In Section 6, it answers to the research question and implications for future research are presented.

2. Conceptual framework

When addressing the perceived added value of a PSS application, two questions should be answered. The first is: what does 'added value' actually mean? It can, for instance, be conceived at the process or outcome level (te Brömmelstroet, 2013). This paper addresses this issue in Section 2.1. The second question is: how can this added value be explained? Section 2.2 addresses this issue by elaborating on three categories of explanatory factors: the support capabilities of the PSS, its usability and the planning context in which it is applied (cf. Geertman, 2006).

2.1. Added value

The added value of a PSS application is often claimed in PSS case studies. Only a few researchers, however, have empirically studied the added value concept in practice (te Brömmelstroet, 2013). An example is a recent paper by Pelzer et al. (2014), who made use of a 'group decision room' (a room with collaboration support tools and process guidance) and qualitative interviews to study the perceived added value of the application of a PSS called MapTable. Their study revealed that particularly improved communication and collaboration are perceived by practitioners as important added values of this PSS application. However, the researchers also pointed to an important caveat related to MapTable: only a few respondents reported on the role of some kind of impact analysis model, which allows one to quantitatively assess the effects of a proposed intervention. Several scholars regard impact analysis as a distinctive feature of a PSS (cf. Brail, 2006). Goodspeed's (2013) study of PSS applications in Austin, Texas, did include impact analysis, and he found learning to be an important perceived added value in these instances. A study by te Brömmelstroet (2010) on transport models (an impact model for exploring the consequences of infrastructure and traffic measures) also reported learning effects of the PSS application, notably an increased insight into the planning issue or into the perspective of other stakeholders. Hence, it can be concluded on the basis of these studies that learning seems to be an important perceived added value of PSS applications.

In this paper, learning is not seen a priori as one of the most important perceived added values of PSS, but is considered to be one of a set of perceived added values. These multiple values of PSS applications can be summarized in a framework that was developed by Pelzer et al. (2014) and is depicted in Table 1. Here, we only briefly explain the main premise of this framework; more details and examples can be found in the original article by Pelzer et al. (2014). The individual level concerns learning effects for the participants involved, which indicates increasing insight into (1) the object of planning that is being discussed and (2) the perspective of other stakeholders involved in the planning process. The added value at the group level involves four dimensions: (1) collaboration between the stakeholders involved, (2) communication, involving the exchange of information and knowledge among the stakeholders involved, (3) consensus, which refers to agreement among the stakeholders about a specific issue, and (4) efficiency, which indicates that the tasks being conducted in a collaborative setting are performed in less time than usual. Finally, the outcome level concerns the extent to which the PSS actually influences the plan or decision resulting from the planning process. This is labelled as a better informed outcome.

2.2. Explaining added value

Te Brömmelstroet (2015) rightly argued that properly identifying the effect of independent variables on the added value of PSS can only be done in a control-rich setting, such as an experiment. However, PSS applications in planning practice never take place in a controlled setting, nor are they ever repeated. It is therefore plausible to assume that the perceived added value is inherently dependent on the context. Geertman (2006) categorized the influence of the context on PSS applications by identifying several context-related factors, such as the characteristics of the users, the process characteristics (e.g. extent of participation) and the unique content of the planning issue at hand.

In addition to the context, the perceived added value is arguably dependent on the support capabilities of the PSS, which can be defined as 'the features of a PSS that facilitate a specific dimension of planning'. Following Vonk (2006), three types of support capabilities can be discerned:

- *Informing*: the primary capability to send information unidirectionally from the PSS to the user.
- *Communication*: the primary capability of the PSS to improve the knowledge exchange among multiple users.
- *Analysing*: the primary capability of the PSS to answer users' questions, particularly through quantitative modelling and analysing.

Table 1
Summary of added values of PSS applications.

Added value	Definition
Learning about the object	Gaining insight into the nature of the planning object.
Learning about other stakeholders	Gaining insight into the perspective of other stakeholders in planning.
Collaboration	Interaction and cooperation among the stakeholders involved.
Communication	Sharing information and knowledge among the stakeholders involved.
Consensus	Agreement on problems, solutions, knowledge claims and indicators.
Efficiency	The same or more tasks can be conducted with lower investments.
Better informed outcome	A decision or outcome is based on better information and/or a better consideration of the information.

Source: Pelzer et al., 2014.

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