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Usefulness of planning support systems: A conceptual framework and an empirical illustration

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ABSTRACT

Planning support systems (PSS) are digital instruments to support planning. Comparatively little attention has been paid to understanding the usefulness of PSS for planning practice and studying its application in real-world planning situations. This paper aims to address this omission. Conceptually, usefulness is subdivided in seven dimensions, and explained by the usability and utility of the PSS. This framework is applied to a case study with *Urban Strategy* – a PSS based on combined environmental and traffic models. A workshop with this PSS was studied using a questionnaire, interviews and observations. The findings indicate that in addition to the more commonly used concept of usability, utility (understood as task–technology fit) is helpful to understand the usefulness of a PSS application. This concept, for instance, helps to indicate when a PSS has a negative effect on planning tasks. Moreover, in addition to usability and utility, context turned out to be critical to understand the usefulness of a PSS application.

1. Introduction

Computer technology is increasingly able to support urban planning. An example is planning support systems (PSS), which are dedicated digital instruments to support planning and policy processes. In the last two decades, a lot more academic attention has been paid to the way in which tools can be used not only to describe and predict spatial reality, but also to help planners. Two rough categories can be discerned within the debate about PSS: articles with a more conceptual focus, often combining insights from planning theory with insights from spatial analysis (Batty and Harris, 1993; Couclelis, 2005; Geertman, 2006, 2008; Harris, 1989; Klosterman, 1997; Moore, 2008), and case studies describing the application of a PSS in a specific planning context (for overviews: Brail and Klosterman, 2001; Brail, 2008; Geertman and Stillwell, 2003, 2009; Geertman et al., 2013). Although most researchers are strongly aware of the relation with planning practice, most of these cases studies are characterized by a central focus on the instrumental characteristics of the PSS (with the notable exception of the chapters in the edited volume by Geertman and Stillwell, 2009). Moreover, while increasing attention is paid to the added value of PSS for planning practice, this is hardly ever measured empirically (te Brömmelstroet, 2013).

Recent studies have responded to this omission or bias by conceptualizing and explicitly measuring the usefulness, performance and effectiveness of support instruments (Arciniegas et al., 2013; Goodspeed, 2013; Nyerges et al., 2006; Pelzer et al., 2014; te Brömmelstroet, 2014, 2013). Although the results of these studies are not conclusive, there is a tendency to conceptualize the usefulness of PSS in terms of scores on a range of sub-dimensions related to both the process and the outcome of planning and policy processes (e.g. Pelzer et al., 2014; te Brömmelstroet, 2013). However, it is not very

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clear how usefulness can be achieved. Whereas several ideas have been developed regarding explanatory variables, such as the involvement in the development of the tool and the transparency of the tool (e.g. Brömmelstroet, 2010; Vonk et al., 2005, 2007), the exact relationship with usefulness remains somewhat opaque. One of the problems in this regard is that many empirical studies report on experiments or workshops aimed at evaluating the tool, rather than studying the usage of PSS in practice. This paper addresses this omission by approaching the usefulness of PSS through both a refined conceptual framework and a case study in a real planning situation. It is important to note that this paper does not argue that rigour or validity of the instrument is unimportant in evaluating PSS, but that this should be complemented by assessing its usefulness for practice. The latter has received relatively little systematized empirical attention in the debates about PSS and the wider debates about instruments and models in planning, and is thus the focus of this paper.

This paper starts with a literature review describing earlier research and different terms relating to the usefulness of PSS, and then presents the conceptual framework that was applied in this study. Next, the methodology section introduces the case that was researched, including the research methods that were applied. Section 4 describes the main findings from the case study. This is followed by a discussion in Section 5. The paper ends with conclusions and recommendations for further research.

2. The usefulness of PSS

2.1. Usefulness: towards conceptual clarity

In a recent article, te Brömmelstroet (2013) observed that PSS case studies hardly ever systematically measure the claims about the performance of the instruments they describe. In several case studies, implicit assumptions are made about the usefulness of the PSS, such as it leads to more efficiency, better participation and a more sustainable outcome, but these are (perhaps very valid) leaps of faith rather than empirically grounded outcomes. However, in recent contributions more attention is paid to this aspect, although the different concepts used can be confusing. Therefore, the most commonly used terms are analytically distinguished in Table 1.

- Performance is used in the aforementioned study by te Brömmelstroet (2013) and in a recent contribution by Goodspeed (2015) in a similar vein as in this paper, namely as the extent to which the PSS has an influence on practice. Goodspeed (2015) focuses specifically on the performances of PSS on the dimension of social learning. However, in other studies, performance is used to describe the content of the PSS, for instance in terms of rigour and validity (e.g. Haasnoot et al., 2014). Hence, performance has a meaning that varies with the study one uses, which makes it not very suitable as an unambiguous conceptual building block.
- Effectiveness combines the two meanings used for performance described above; it includes dimensions of both the instrument and the influence the instrument has on practice, and complements this with the usability dimensions (e.g. Arciniegas et al., 2013; Inman et al., 2011). Whereas these studies are very precise about the dimensions or criteria that comprise effectiveness, no distinction is made between the functioning of the instrument and the influence on practice, whereas for the purpose of this paper the former (the functioning of the instrument) is an independent variable and the latter (the influence of practice) is a dependent variable.
- Added value has been used in some recent PSS studies. It refers to the positive influence a PSS can have on practice (Pelzer et al., 2014, 2015a; te Brömmelstroet, 2015). Added value is conceptually consistent with usefulness, the term used in this paper. However, usefulness is preferred over added value because the former is being increasingly used in empirical studies, such as the COST action related to this special issue (e.g. Larsson et al., 2014), and builds upon a tradition of studies on the usage of ICT (Nielsen, 1993).
- Usefulness, according to Nielsen (1993, p.24), is the 'issue of whether the system can be used to achieve some desired goals'. PSS usefulness has two interrelated dimensions: (1) the different kinds of usefulness a PSS can have, such as a more informed outcome and increased efficiency, and (2) the extent to which a PSS can help to achieve desired goals. Because in complex, real-world planning situations it is very difficult to precisely outline the 'desired goals' beforehand, the focus in this paper is on different kinds of usefulness, which are assessed *ex post*. In doing so, this paper uses a conceptual framework developed by Pelzer et al. (2014). In this framework (see Table 2), usefulness is subdivided into seven dimensions, based on for example earlier work in group model building (Rouwette et al., 2002). Empirical studies have shed light on

Table 1
Commonly used measurements of PSS.

Concept	Description	Relevant articles
Performance	The kind of influence a PSS has on practice *or* the quality of the instrument	te Brömmelstroet (2013), Goodspeed (2013), and Haasnoot et al. (2014)
Effectiveness	The extent to which a PSS has a positive influence on practice *and* the quality of the instrument	Arciniegas et al. (2013) and Inman et al. (2011)
Added value	The kind of influence a PSS has on practice	Pelzer et al. (2014, 2015a) and te Brömmelstroet (2015)
Usefulness	The kind of influence a PSS has on practice	Larsson et al. (2014)