
Knowledge in communicative planning practice: a different perspective for planning support systems

Peter Pelzer, Stan Geertman

Department of Human Geography and Planning, Utrecht University, 3508 TC Utrecht, The Netherlands; e-mail: p.pelzer@uu.nl, s.c.m.geertman@uu.nl

Rob van der Heijden

Institute for Management Research, Radboud University Nijmegen, 6500 HK, Nijmegen, The Netherlands; e-mail: r.vanderheijden@fm.ru.nl

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Abstract. Although planning support systems (PSS) have now undergone more than two decades of research and development, this is not reflected in their practical application. In this paper we argue that one of the reasons for this is that too much emphasis is put on the instrument rather than the usage and planning context. A better understanding of the relationship between planning practice and PSS is needed in order to improve the role of the latter. We argue that communicative and analytic approaches to planning should be combined. A key to this is a more careful conceptualization of the concepts of knowledge and planning support. Therefore, we have developed a conceptual framework in which the characteristics and evaluation of knowledge and the role of planning support are central. Combined with the notion of storytelling, we believe that this results in a perspective for PSS that has potential for future applications. We conclude the paper with recommendations for future research.

Keywords: knowledge, planning support, planning support systems, planning theory, storytelling

1 Introduction

For many years the focus in spatial planning has been on designing a plan based on the input from a limited group of scientific experts. This scientific-analytical approach has been criticized from various angles and alternative approaches have evolved. The ‘communicative turn’ in spatial planning is arguably the most profound. Since this turn, a much stronger emphasis has been put on the collaborative, interactive, communicative, and participatory nature of spatial planning (eg, Healey, 1992; 2007; Innes, 1998; Innes and Booher, 2010). Rydin (2007, page 54) states that this “new orthodoxy clusters around the idea that the core of planning should be an engagement with a range of stakeholders, giving them voice and seeking to achieve a planning consensus.” However, this approach has also led to relativism, and scholars have warned of the production of ‘negotiated nonsense’ (eg, van de Riet, 2003). In the words of Deal and Pallathucheril (2008, page 61):

“In recent years, community visioning exercises have been increasingly used ... but those activities are rarely grounded in data or deep analysis; sometimes they amount to little more than wishful thinking.”

We posit that particularly geo-ICT tools that are designed specifically for spatial planning—namely, planning support systems (PSS)—can play a crucial role in combining analytical and communicative approaches to planning. PSS can be defined as “geoinformation technology-based instruments that incorporate a suite of components that collectively support some specific parts of a unique professional planning task” (Geertman, 2008, page 217).

In order to prevent conceptual confusion, it is important to make a distinction between 'planning support' and 'planning support systems'. 'Planning support' refers to the activity of aiding planning processes, an act that can take place in many forms and can be supported by a range of tools. PSS are a means to achieve these goals, whereby its distinctive characteristics [compared with, for instance, a geographic information system (GIS)] are the focus on aiding specific planning tasks, and in doing so "PSS usually consist of a combination of planning-related theory, data, information, knowledge, methods, and instruments that take the form of an integrated framework with a shared interface" (Geertman and Stillwell, 2009, page 3).

In the last decade several edited volumes and journal articles (Brail, 2008; Brail and Klosterman, 2001; Geertman and Stillwell, 2003; 2009; Geertman et al, 2013) have sketched the characteristics, applications, and alleged virtues of a range of PSS, such as WhatIf? (Klosterman, 1997; 2008), LEAM (Deal and Pallathucheril, 2008; 2009), UrbanSim (Waddell, 2011; Waddell et al, 2008), CommunityViz (Janes and Kwartler, 2008), and SLEUTH (Clarke, 2008; Dietzel and Clarke, 2007). Despite these technological advancements, the number of planning institutions that actually use PSS in their regular working processes is still limited. Moreover, most organizations lack both knowledge of how to apply PSS and experience of doing so (Vonk et al, 2005).

Two reasons for this underutilization can be distilled from the academic literature. First, there is the notion that technology implementation takes time and has to overcome a diversity of bottlenecks and barriers, such as resistance to change and working habits that have been in place for years (Timmermans, 2008; Vonk et al, 2005). The second reason is that PSS are considered insufficiently sensitive and attuned to the specific demands of planners and the characteristics of the planning process (Geertman, 2006; 2008; te Brömmelstroet, 2010). Van Kouwen et al (2009, page 64) even argue that: "DSS [decision support systems] and PSS tools do not bridge the gap between knowledge and policy making, but are rather part of the problem."

This problem can be understood better by focusing on how the role of planning support is perceived. Traditionally this role has been envisioned in scientific-analytical terms; simply stated, it was assumed that there is a linear relationship between the way in which scientific knowledge is generated and provided, and its usage in practice. A result of this scientific-analytical view on the role of planning support is that in discussions on the application of PSS, most emphasis is put on the support technology itself rather than on its added value for planning practice, as noticed by several authors (Campbell, 1995; Geertman, 2008; te Brömmelstroet, 2010; 2013). As Batty notes (2008, page 6): "Technique rather than theory has come to dominate, and thus developments in computational technologies are tending to drive the field."

Conversely, the added value of PSS for planning practice is often taken for granted (cf te Brömmelstroet, 2013) and considered to be related to the quality of the support technology itself. In contrast, we argue that what should be put central in the analysis of how planning support should take place are the characteristics and knowledge demands of planning practitioners, rather than the PSS that are applied (Geertman, 2006). As Campbell (1995, page 104) argues:

"technologies do not function independently of their environments, rather, they gain meaning only as individual staff members in a particular cultural and organizational context interact with them."

Moreover, a scientific-analytical view of planning support seems to be out of line with planning's power-driven (Flyvbjerg, 1998) and communicative nature (Healey, 1992; Innes, 1998).

Responding to these criticisms and the underutilization of PSS, in this article we elaborate on a different perspective for PSS in spatial planning practice. Although relevant contributions have recently been made to address the use of PSS from a planning perspective (eg, Geertman, 2006; Moore, 2008; te Brömmelstroet and Schrijnen, 2010; Vonk et al, 2007), there is arguably a need for a more detailed analysis and stronger roots in the planning theoretical debate, as this could lead to new directions for research on, and the better utilization of, PSS. Here we seek to combine scientific-analytic and communicative approaches to planning. In doing so, we build explicitly upon authors who discuss the usage knowledge in planning (Healey, 2007; Rydin, 2007), the role of scientific knowledge, here conceived as planning support (Amara et al, 2004; Weiss, 1979), and the potential of storytelling (Couclelis, 2005; Guhathakurta, 2002; Hajer et al, 2010).

The paper is structured as follows. Section 2 introduces knowledge as a central concept in developing a better role for PSS. This notion is complemented in section 3 by an overview of the possible roles of planning support. These two sections are the buildings blocks for section 4, in which we develop a perspective for PSS that combines the insights from the previous sections, and elaborates on the concept of 'knowledge claim testing' and 'storytelling' as important insights for planning support. In section 5 this notion is related explicitly to PSS. We conclude in section 6 with a synthesis of the findings and a brief discussion.

2 Information, knowledge, and planning support

According to Geertman (2006), the debate about PSS focuses far too much on technology. He argues that too little attention is paid to what he calls the 'planning-conceptual' aspects of planning. In developing his argument, Geertman distils several explanatory factors for the potential role of planning support (including the position of the users and participants and the political planning context). Moreover, he observes another factor that is notably in need of an improved conceptualization and connection to the debate about PSS: knowledge and information. Based on the work of Dretske, Couclelis (2003, page 165) distinguishes the two prosaically: "[There are] two types of information-processing system: the type that is capable of converting the information it receives into knowledge and the type that is not. ... The first kind of information-processing system, the kind capable of converting information into knowledge, is we; the GIS is of the second kind." In line with this, knowledge is defined here as:

"Both the stock of data and information a planning stakeholder possesses, but also the interpretations and appreciations of data and information a planning stakeholder (to a certain extent) *considers to be ... correct*" (adapted and translated from Van de Graaf and Hoppe 1989, page 69, emphasis added).

The last part of the definition—*considers to be correct*—is crucial, since it relates to the validity of the knowledge used in planning.

2.1 Validity: knowledge claims

Rydin (2007) acknowledges that communication and collaboration are critical characteristics of planning, but is concerned about the validity of knowledge. She argues for explicitly testing the validity of knowledge claims presented by different stakeholders in the planning process. In order to do this in a relatively structured way, she distinguishes four types of claims about knowledge in reality: empirical claims, process claims, predictive claims, and normative claims.

Empirical knowledge claims are about the socioeconomic and environmental situation at a specific moment in time. This can refer to the current situation, or to the future situation after a planning intervention has occurred. *Process* knowledge claims refer to the dynamics of planning and spatial phenomena, that is, how societal processes work and how they conjunct

with planning interventions. *Predictive* knowledge claims are explicitly focused on the future and deal with the prediction of trends in reality, which in this regard can be extended to all kinds of trend scenarios without an intervention. *Normative* knowledge claims are about specifying the goal of planning (Rydin, 2007); according to Rydin (page 61), they have to be grounded in reality, however: “not any imaginings will serve as a planning goal. There has to be an engagement with possible realities.”

This fourfold distinction is relevant to planning support, since it provides a systematized way to evaluate the different claims about knowledge that play a role in planning. Planners should test the validity of different claims in a deliberative process. Here, Rydin (2007) reminds us that different knowledge claims can coexist and that there is no a priori hierarchy of knowledge claims: scientific insights are not necessarily more valuable than experiential knowledge. Scientific insights have a form that is very different from insights related to local experiences. Consequently, experiential and systematized knowledge complement each other and this needs to be taken into account.

2.2 Complementarity: knowledge forms

In his famous book *Planning in the Public Domain: From Knowledge to Action* Friedmann (1987) argues that experiential or practical knowledge is equally as important to planning as scientific or technocratic knowledge. Healey (2007) elaborates on this issue when she discusses the forms that knowledge in planning can take. She argues

“What we know exists in many forms, from systematized accounts and analyses, and practical manuals, to stories exchanged in the flow of life, and skills exercised in doing practical work” (page 245).

Thus, the identified forms of both systematized knowledge (based on logic and scientific analysis) and experiential knowledge (based on experiences and often ‘tacit’ in nature) should be taken into account.

An interesting example of this is given by Carton and Thissen (2009), who state that the role of maps in urban and regional planning depends on the frame of the users, and this is related to their knowledge base. For instance, stakeholders with a ‘design frame’ (eg, urban designers, landscape architects) tend to rely foremost on experiential knowledge, whereas stakeholders with an ‘analysis frame’ (eg, environmental analysts, transport planners) often possess a systematized knowledge base (see also Pelzer et al, 2013).

While the work of Friedmann (1987), Healey (2007), and Rydin (2007) helps us better to understand the role of knowledge in planning better, these authors do not focus explicitly on the role of knowledge in planning support. In the following, we present some examples of how knowledge claims and knowledge forms can be applied to various instances of planning support.

2.3 Claims, forms, and planning support

In planning practice, one will likely find combinations of knowledge claims and knowledge forms being supported by specific instances of planning support. For instance, an example of planning support that combines systematized knowledge and empirical knowledge claims is *impact analysis*. Crucial in planning—and particularly in PSS—is the ability to assess the consequences of planning interventions, for instance, through impact analysis (Brail, 2006; Klosterman and Pettit, 2005). In this way, the effect of a planning intervention for a new situation at a future moment in time (described by an empirical knowledge claim) is explored. This is a form of planning support that connects to the systematized knowledge demands of planners, for instance, traffic planners who assess the impact of an extra bridge across a river (eg, Deal and Pallathucheril, 2009).

Empirical knowledge claims and experiential knowledge result in a different kind of planning support that can be found, in particular, in the field of participatory GIS

(eg, Dunn, 2007; Geertman, 2002; Kahila and Kytä, 2009; McCall and Dunn, 2012). Here the main purpose of planning support is to gather local or lay knowledge and introduce it into the planning process. Residents' perceptions of their neighbourhood can be visualized through illustrations, mental maps, photos, drawings, narratives, and testimonials, which can then be communicated between planning professionals.

The combination of systematized knowledge and process knowledge claims is not a very common instance of planning support. However, in the field of system dynamics attention is paid to these aspects (eg, Vennix, 1999). System dynamics often applies group model building, which is:

“a generic label for all approaches that involve the client in the system dynamics model building process, be it in the conceptualization and/or formalization and simulation of the model” (Vennix, 1999, page 392).

Crucial here is that this methodology is applied in multiactor workshops with the additional aim of strengthening the process of interaction, usually between professional stakeholders. Dedicated software can be applied to understand the relevant causal linkages of the planning object [for a planning example, see Van Kouwen et al (2009)].

In sum, different combinations of knowledge forms and knowledge claims play a role in planning practice, depending on the context and the planning issue at hand, resulting in a different manifestation of planning support in different instances. Moreover, the usage of planning support depends on how it is applied, which is something we now elaborate upon.

3 Roles of planning support within planning practice

As noted in the introduction, many studies either implicitly or explicitly have an instrumental or a scientific-analytical conception of the role of planning support within practice: the output from a planning support instrument is considered to be directly applicable to solving a planning problem. Following, among others, Weiss (1979) and Amara et al (2004), we argue that this perspective covers only part of the way in which planning support functions. Following these authors, four roles of planning support can be discerned: scientific-analytical, tactical, learning, and interactive roles.

Scientific-analytical planning support refers to the direct application of knowledge in planning practice. It can be considered part of traditional spatial planning. This approach is found in situations in which science precedes practice ('survey before the plan') and where the planning problem is well-defined and agreed upon. It rests on the belief that following the right arguments, procedures, and techniques will result in an optimal planning solution. This view has been very attractive to the developers of a variety of quantitative models ranging from land use to traffic flows. The scientific-analytical view of planning support has been criticized, particularly by planning scholars specializing in power relationships, for being naive and failing to acknowledge the power relations that preempt rationality (Flyvbjerg, 1998; Flyvbjerg and Richardson, 2002).

Tactical planning support points to an awareness of the interests of the actors involved and their power relations. The main aim is to arrive at a result, rather than to gain new insights or solve problems (Amara et al, 2004; Weiss, 1979). This role of planning support can be interpreted both negatively and positively. On a negative note, the outcomes of planning support are not important because positions have been taken beforehand. To an important extent, activities relating to planning support are subjugated to other interests. There is: "little relation to the substance of the research. It is not the content of the findings that is invoked, but the sheer fact that research is being done" (Weiss, 1979, cited in van Schaick, 2011, page 94). On a positive note, a tactical perspective leads to a more open discussion about the interests of the involved stakeholders. In recent articles, there are several examples in which negotiation is the central aim of planning support (eg, Arciniegas et al, 2011)

The central premise of planning support as *learning* is that knowledge is used in an indirect, unexpected, and implicit way (Amara et al, 2004; Innes, 1998). Knowledge is used not for direct problem solving, but for enlightenment and understanding, which occurs in a nonlinear way. In that respect, Schön's *The Reflective Practitioner* (1983) emphasizes the importance of experiential learning and continuous reflection by planning stakeholders. As, for instance, van der Hoeven et al (2009, page 162) note about the Land Use Scanner tool: "It aims to facilitate the learning of the user on the subject, instead of giving unambiguous answers on what management strategy is preferable."

Interactive planning support starts from the perspective that planning support is a social process in which all stakeholders should be involved. Consensus seeking, collaboration, and participation are central notions that resonate strongly with Habermas's (1983) premise of communicative rationality [for spatial planning, see Healey (1992), Innes (1998), Innes and Booher (2010)]. This role of planning support is also attracting more attention in the field of participatory GIS (eg, Dunn, 2007; Geertman, 2002). Soutter and Repeti (2009, page 386), for example, state about their SMURF tool: "In our experimentation, participation is used to constitute a knowledge base that supports decision making and consensus building."

That planning support can play multiple roles in a planning process has so far not been acknowledged explicitly in the academic debate. This triggers the question about how these roles can be combined in a manner that is beneficial to planning practice.

4 Towards a new perspective

As has been widely documented, a purely scientific-analytical perspective on the role of planning support ignores the communicative, political, and participatory nature of present-day planning practice. Other planning support roles—tactical, learning, and interactive—have arguably become at least as important. We postulate that the notion of 'knowledge claim testing' is relevant for such a broad perspective of planning support.

4.1 Planning support as knowledge claim testing

As elaborated in section 2, Rydin (2007) argues that in planning, knowledge claims should be tested continuously on their validity. She describes this as:

"the planning system should be conceptualized as a series of arenas in which a variety of knowledges engage with each other, with planners not just responsible for procedural aspects of the engagement but more actively involved in the co-generation of knowledge through testing and recognizing knowledge claims" (page 58).

As argued, including different knowledge forms is an important condition for testing these claims.

The central idea of testing knowledge claims is that of 'opening up' and 'closing down': "There needs to be space for giving voice to these various claims—*opening-up*—but also for testing and ultimately recognizing these claims—*closing-down*" (Rydin, 2007, page 58). Opening up with regard to knowledge claims involves offering a stage at which knowledge can be introduced, gathered, discussed, and recognized. This knowledge can take different forms (experiential, systematized) and can be provided by multiple stakeholders. Closing down, on the other hand, is arguably an even more complex endeavour. This implies deciding upon the validity of a certain knowledge claim. In this regard, stakeholders commonly accept that a knowledge claim is, at least temporarily, valid. This might apply to, for instance, a shared understanding about how the near future will unfold with regard to demographic changes.

4.2 planning support roles and knowledge claim testing

With regards to opening up, the contribution of *scientific-analytical* planning support lies mainly in ensuring the inclusion of systematized knowledge through the input of, for example, data, models, and quantitative maps. In relation to closing down, planning support can function

as a sieve to separate sensible ideas from nonsense or nonproductive emotions. Moreover, scientific-analytical planning support is a legal requirement in various decision contexts, for instance, when evaluating whether a plan meets the environmental quality standards.

With regard to *tactical* planning support, we should recognize that it somehow conflicts with the notion of knowledge claim testing. The notion of assessing the validity of a knowledge claim that basically represents existing insights or viewpoints does not really match with planning support activities that aim to review such claims critically. The degree of freedom for the support seems limited to reconfirming the claim. However, if approached more positively from a negotiation perspective, tactical planning support can play a beneficial role in ensuring that a plan is in fact made or a decision is actually taken. In a negotiation setting, the opening up of knowledge claims can lead to a better understanding of the interests of other stakeholders. Nonetheless, tactical planning support should always be complemented by planning support as learning and interactive planning support.

Planning support as *learning* is crucial in the opening up phase. Facilitating insight into knowledge claims that take different forms ensures that different knowledge claims are not only put on the table, but also potentially grasped by others. An example can be found within professional planning circles, in which different professionals with clearly distinctive disciplinary backgrounds need to communicate their knowledge claims. Wyatt (2004), for instance, points in this regard to the problematic communication between architects and planners. Moreover, closing down can be considered the outcome of a learning process. After a process in which arguments and perspectives were exchanged and an attempt was made to understand knowledge claims, stakeholders can decide to accept or reject the validity of a specific knowledge claim.

Interactive planning support is related to the entire process of knowledge claim testing, which should occur in a continuous collaboration between the involved stakeholders. According to Rydin (2007, page 58), this connects to Habermas's (1983) view of communicative rationality, which has been of seminal influence on contemporary collaborative planning theory:

"Rather than being at odds with the Habermasian roots of collaborative planning theory, there are strong connections since Habermas sees the illocutionary acts of speech as necessarily involving validity claims if they are to constitute communicative action."

The specific role of interactive planning support lies in ensuring that all knowledge claims, in different forms, are on the table, and in facilitating the search for consensus about these claims. In the case of spatial planning, this can be facilitated by providing a spatial language (eg, GIS maps) that supports the debate between different professions about the validity of the different knowledge claims.

Nonetheless, whereas testing knowledge claims is a very relevant element of planning, it is not an encompassing perspective to make sense of or give guidance to planning. We believe such a perspective is needed in order to relate the idea of knowledge claim testing to planning support. In that, the concept of 'storytelling' is considered of particular relevance.

4.3 Storytelling and planning support

Several authors have emphasized the importance of storytelling for planning (eg, Couclelis, 2005; Hajer et al, 2010; Throgmorton, 1996). Hajer et al, (2010, page 22–23) describe storytelling in a way that resembles Rydin's (2007) idea of knowledge claim testing:

"Good regional planning is like a tribunal, at which all claims—knowledge, position, interests—are confronted with each other with the aim of arriving at a final verdict, a cohesive story."

Storytelling exists alongside other future-oriented approaches to planning, such as scenario planning and visioning (Couclelis, 2005; Hopkins and Zapata, 2007). Whereas these kinds of

approaches have been connected to planning support on various occasions (eg, Brail, 2008; Geertman and Stillwell, 2009), storytelling has been related to PSS in only a few instances (Couclelis, 2005; Guhathakurta, 2002).

This notion of storytelling is rooted strongly in the idea of planning as a deliberative and discursive practice. Planning is conceived as developing a story about a specific spatial area—a story that has a beginning, a middle, and an end (Kaplan, 1993). This story is developed in a continuous iteration, in which stakeholders modify or add to the larger whole (Hemel, 2010). In order to have effect, “good stories should be logically consistent, empirically testable, morally acceptable, actionable, and aesthetic” (Couclelis, 2005, page 1367). In short, storytelling is about the integrative development of both a process (the act of telling the story) and a content (the storyline).

Whereas storytelling is often addressed as a recommended path to follow (eg, Hajer et al, 2010), according to van Hulst (2012), storytelling can be considered to be both a model *for* and a model *of* planning. Put differently, it is both an analytic lens to a better understanding of how planning works, and a normative perspective on how planning should be conducted. Both foci are of relevance from the perspective of planning support, but the emphasis here is on the potential of storytelling as a model of planning.

According to Couclelis (2005, page 1367), who makes an explicit connection with PSS, storytelling is an explorative identification of how the future *could* look. In other words, in developing a story the involved stakeholders combine empirical knowledge claims (what is our point of departure and what are the effects of interventions?), process knowledge claims (how do the causal mechanisms of spatial phenomena and planning processes function?), predictive knowledge claims (how might the future look?), and normative knowledge claims (how should the future look?). In a collaborative process, this inevitably includes the synthesis of experiential and systematized forms of knowledge. These stories go beyond a discourse among specialists, since “good storytelling can help to clarify the implications of different alternatives and build consensus by presenting particular desired or feared future developments in terms meaningful enough to be credible to *nonspecialists*” (Couclelis, 2005, page 1353, emphasis added). Combining lay or experiential knowledge with systematized or scientific knowledge is traditionally problematic; yet the advantage of a storytelling approach is that it aims not for a truth claim at a certain point in time, but to develop a cohesive story about how the spatial future might unfold as a result of both planning interventions and autonomous trends. Or, in the words of Guhathakurta (2002, page 909):

“It is commonplace in modern relativism to have multiple versions of events, and stories about them, which raises suspicion about claims of the ‘real’ or the ‘true’ version of that event. However, the value of storytelling is not to separate the ‘true’ from the ‘false’ but to make sense of that reality.”

5 Implications for PSS

The previous section has focused mainly on conceptual considerations of planning support in relation to storytelling and knowledge claim testing. This section makes a more concrete connection to planning practice by discussing the implications of the aforementioned ideas for PSS. For Couclelis (2005) the role of PSS in supporting storytelling lies in separating sense from nonsense. She argues that PSS “can provide methods and tools for distinguishing between possible futures and utopias” (page 1368). This notion resembles Rydin’s (2007) idea of normative knowledge claims, which have to be connected to possible realities. A PSS can support the inclusion of normative knowledge claims grounded in rational analysis.

In addition, Couclelis (2005, page 1368) points at the visual potential of present-day PSS:

“The multimedia capabilities of current PSS are very well suited to this task and can be used along with dynamic models to provide spoken narratives built around the land-use dynamics processes unfolding on the screen, illustrated with a variety of compelling visualizations.”

Schroth et al (2011, page 67) provide a concrete example of the benefits of interactive visualization:

“The interaction among community stakeholders and researchers in constructing the visualizations allowed both parties to more fully understand the analytical scope and geographical scale of the issues under exploration. The visualizations became a shared platform enabling construction of a common mental model of the landscape among all participants.”

In addition to this visual potential, several state-of-the-art PSS include some kind of quantitative model that supports systematized knowledge as input to evaluate claims (scientific-analytic planning support). On the other hand, in PSS the combination of a map (eg, GIS, paper) and a model can facilitate communication (interactive planning support) and learning processes (planning support as learning).

A challenge that permeates all these roles of planning support in the PSS debate is to obtain a balance between systematized and experiential knowledge. Kahila and Kytta (2009) describe, for instance, how they apply their planning support system ‘SoftGIS’ to gather local and experiential knowledge, and how this forms valuable input for policymaking. The real challenge, however, arises when systematized knowledge (eg, knowledge based on modelling the noise pollution of traffic flows) is confronted with experiential knowledge (eg, local experiences of traffic pollution adjacent to certain roads). A promising example of this is given by van Delden and Hagen Zanker (2009), who connect the development of qualitative storylines to quantitative modelling exercises. According to the authors, this has benefits:

“By going through an iterative process, communication and social learning will be enhanced and will lead to a better understanding of the overall scenario that includes narrative storylines as well as quantitative modelling” (page 363).

More generally, PSS should arguably take some distance from their predisposition to modelling and systematized knowledge, and become more sensitive to experiential knowledge. Experiences with, for instance, participatory GIS are promising in this regard (Dunn, 2007; Geertman, 2002). Here, it should be noted that it will not always be possible to come to a widely appreciated test of knowledge claims. However, when communication among stakeholders from different backgrounds is facilitated and improved, it becomes easier to distinguish between knowledge claims upon which agreement can be reached directly and those that are ambiguous, need follow-up research, and/or lead to conflicting viewpoints. Experiences with map-based touch tables suggest that collaboration around a table depicting geographic representations results in a fruitful exchange of knowledge. Moreover, this provides a ‘spatial language’ that might help to overcome seemingly incommensurable differences between experiential knowledge forms and systematized knowledge forms.

An important finding from the application of group model building (eg, Vennix, 1999) and a recent study on PSS (te Brömmelstroet and Schrijnen, 2010) indicate that the activity of developing a model or tool in a collaborative process is at least as important as using the result for further analysis. The collective story is actually developed during the process of, for example, setting the right parameters and identifying relevant factors or causal relationships. Since this is a collaborative process, it relates to interactive planning support. Therein, learning is also a crucial aspect, since developing a model might be as important as using it; it is therefore called “modelling as learning” (Vennix, 1999, page 379).

Furthermore, this collaborative process of developing PSS can include a stepwise inclusion of all the four types of knowledge claims (empirical, process, predictive, and normative), enabling, at the same time, a decision to be made on which claims will be tested at which stage in the planning process. If this is organized well, PSS that are collaboratively developed and applied help to set the agenda for a systematized approach to testing the relevant knowledge claims. PSS can also function as memory devices or logbooks, allowing discussions and knowledge claims that have already been closed to be retraced. This makes long-term planning processes less vulnerable to changes in personnel, and potentially stimulates a long-lasting usage of a story in the planning area.

In sum, there is a range of possibilities for PSS to play a role in a planning context in which knowledge claim testing and storytelling are central. These functions include: making a distinction between sense and nonsense, developing a shared visual or spatial language, learning from the causal dynamics of the applied models, and providing a more structured and efficient approach. However, it should be noted that these are just some initial thoughts; future empirical research should shed a more refined and detailed light on this.

6 Conclusions and future research

This paper was triggered by two observations. The first concerns the dominance of communicative or collaborative approaches in planning, in which participation, collaboration, and the process of planning sometimes seem to have become more important than the substance of the planning issue at stake and its rigorous analysis. The second observation concerns the identification of the potential of PSS to link the analysis of substance with the interactive and collaborative process of planning, although this requires further conceptualization. A barrier that has to be overcome here is that, usually, the primary focus is on the technological characteristics of PSS, rather than on the supporting role in applications. Therefore, in this paper we developed a perspective for PSS that is more sensitive to the role of knowledge and its supportive application in spatial planning. We believe that an improved understanding of planning support will contribute to improved spatial planning. PSS can eventually lead to better justified outcomes (based on more complementary and validated knowledge), as well as to a more open and systematized process of planning.

With respect to this perspective, we argued that it is critical to pay attention to the characteristics of knowledge in the planning process (in particular, knowledge forms and claims) and to the roles in practice that PSS can fulfil. Notably, the concepts of knowledge forms, knowledge claim testing, and storytelling constitute the core of this perspective for PSS. PSS can systematically facilitate the testing of different knowledge claims in planning. There are various potential contributions: for example, setting the agenda, gathering experiential knowledge, providing input of quantitative information, functioning as a logbook, and facilitating communication among participants from different backgrounds. We conclude this paper with some reflections on how the field of PSS can contribute to this endeavour.

The field of PSS is a dynamic one in the sense that both technology and planning are continuously changing. As argued, we believe that the presented view on planning support provides chances for a better support function of PSS. With regard to the instrumental characteristics of PSS, it will be essential for PSS to be able to accommodate both quantitative and qualitative information. This will help to support different types of knowledge demands, rather than a one-sided support of more technically inclined stakeholders. Information technological developments provide several opportunities for this purpose: 3D visualizations are very easy to develop, and software such as Google Maps is used even by people with absolutely no affiliation with GIS. Including spatial visualizations and quantitative models might also contribute to what Hajer et al (2010) call a 'strong story', because it is rooted not just in words, but also in numbers and maps.

Besides the capabilities of PSS to handle different knowledge forms and types of information, the application context of PSS is also at stake. Attention to the context characteristics of the application of PSS should be part of the development of an appropriate methodology for PSS. This implies, for example, the involvement of a variety of stakeholders and their diverging knowledge demands. Complex PSS that rely strongly on quantitative data might work well in a small setting of scientifically oriented professionals, such as environmental analysts or transport planners. However, if the group of participants also includes urban designers or, for instance, residents, more attention should be paid to visually appealing and intuitive ways of presenting different kinds of information. Moreover, inherent to storytelling and knowledge claim testing is that during the planning process a knowledge claim has to be closed down. Consequently, the methodology of PSS requires moments of both diversion (opening up) and conversion (closing down).

Since we have presented mainly conceptual considerations, empirical research is needed to evaluate and refine these ideas. This will require scholars in the field of PSS to report more systematically on the factual experiences of the stakeholders (te Brömmelstroet, 2013). It would be relevant to study empirical case studies in which PSS are applied to open up and close down different knowledge claims in different knowledge forms. Both research and practice can potentially learn a lot from case studies of these kinds of knowledge-oriented PSS.

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