Networked dynamics of knowledge integration in strategic spatial planning processes: a social network approach

Susa Eräranta & Miloš N. Mladenović

Submit your article to this journal

Article views: 2081

View related articles

View Crossmark data

Citing articles: 3 View citing articles

Routledge
Taylor & Francis Group

RSA Regional Studies Association

Networked dynamics of knowledge integration in strategic spatial planning processes: a social network approach

Susa Eräranta[a] and Miloš N. Mladenović[b]

ABSTRACT
Planning processes guiding sustainable urban futures are typically complex, non-linear and value-laden, but their knowledge dynamics are still not adequately understood. This paper explores the potential of social network analysis (SNA) as a part of mixed-method approach for analysing the dynamic social context of knowledge integration in planning processes. The empirical study uses detailed longitudinal data of a four-year statutory planning process in the Nordic context, providing a methodological contribution for understanding knowledge integration in planning with visual–analytical methods and actor-relational criteria. Findings provide a new understanding of the actual social realities of planning practice and the further conceptualization of situated process dynamics.

KEYWORDS
planning process; planning practice; social network analysis; knowledge integration; process dynamics

INTRODUCTION

Rapid urbanization and the growth of societal and environmental challenges set prerequisites for sustainable urban planning practice, which requires an understanding of the dynamic systemic interrelations between various societal sectors and scales (Graute, 2016; Healey & Shaw, 1993). Urban planning and development processes have a profound role in answering to the complex societal challenges by enabling the simultaneous consideration of various interrelated aspects. The capacity to adapt to these diverse and changing societal needs is influenced by learning in organizations (Senge, 1990). However, public administration has been traditionally known for its siloed and hierarchical structures, which prevent holistic understandings that go beyond reductionistic and linear cause–effect chains. Moreover, previous research has suggested that learning in public sector organizations occurs in structural settings, which encourage knowledge co-creation through interaction (Moynihan & Landuyt, 2009; Siciliano, 2017). In order to answer to the need of more systemic understanding in the field of planning, integrated planning and related concepts have been studied previously (Holden, 2012; Hrelja, 2015; Stead, 2008; te Brömmelstroet & Bertolini, 2010; Tornberg, 2011).

Planning as a collaborative process (Innes & Booher, 2010) has been suggested to be profoundly dependent on the utilization of multiple knowledges (Davoudi, 2015). The effective use of knowledges has been seen as essential for enabling positive change in planning (Rydin, 2007). Knowledge integration supports the co-creation of knowledges in a collaborative process over time, moving from specialized individual knowledge areas to collectively integrated solutions (Majchrzak et al., 2012). The definitions of knowledge integration vary from coordination of specialist knowledge (Tell et al., 2017), transformation of individual knowledge into collective knowledge (Okhuysen & Eisenhardt, 2002), or as a collective process, which is built on interaction (Huang & Newell, 2003). Despite the differing definitions, most definitions share the view that knowledge is integrated in social processes between interrelated individuals, and is dynamic by nature (Enberg et al., 2006; McIver et al., 2019). Thus, in this paper, knowledge integration is understood *as the process of co-creating new knowledges in the interaction of individual specialist knowledges and judgment in organizational settings.*

CONTACT

[a] susa.eraranta@aalto.fi
Department of Built Environment, Aalto University, Espoo, Finland; and City of Helsinki, Urban Environment Division, Helsinki, Finland.
[b] milos.mladenovic@aalto.fi
Department of Built Environment, Aalto University, Espoo, Finland.

The focus on knowledge co-creation means that knowledge-sharing and knowledge integration are to be distinguished from each other, placing an emphasis on the social nature of developing new knowledges.

Planning research has already suggested that rational processes are a misfit when addressing complex societal issues (Rittel & Webber, 1973), because in planning, new knowledge is typically created in the interaction of conflicting values (Healey, 1992). Consequently, discussion of the social nature of planning has emerged, suggesting that knowledge is continuously socially constructed through filtration, selection and post-rationalization (Davoudi, 2015) in collaborative processes (Forester, 2008; Innes & Booher, 2010). To elaborate further on the collaborative nature of planning, Booher and Innes (2002) have argued that the diversity and interdependence of actors in planning processes – *the network power* – is a critical resource for better planning outcomes. New knowledge can be developed in networked settings, which allow interaction (e.g., Contractor & Monge, 2002; Phelps et al., 2012; Reagans & McEvily, 2003). Thus, communication and collaboration are essential requirements for integrated planning practice, and social networks are a key to transferring information and co-creating new knowledges in these processes (Vigar, 2009). Planning research also includes analyses of the communities of practice and the impact of different administrative steering systems on how practitioners perceive the rationality of planning. For example, the concepts of 'trading zone' and 'boundary object' have been used in this context (Balducci & Mäntysalo, 2013).

A central problem facing planning research and practice is the insufficient understanding of these complex dynamics of knowledge integration and learning processes in planning practice. Even as social context is critical for knowledge co-creation in planning (Koglin, 2015; Holden, 2012), the actual dynamics of knowledge-integration processes are not yet understood well enough. Previous research has addressed the complexities of collaborative planning processes (Forester, 2008; Healey, 1997; Innes & Booher, 2010), but systematic and replicable methods for analysing their social dynamics have lagged behind. More specifically, Dempwolf and Lyles (2012) have identified a lack of empirical knowledge of how individuals in planning processes are embedded in the dynamic networks for addressing the complex societal issues. In previous research, the everyday of integrated planning practice has not been studied much (Hull, 2008; Stead, 2008). Simplistic process descriptions have been questioned (van de Ven, 1992), as the generalized process descriptions may largely ignore the often invisible dynamic and complex realities of everyday processes (Siciliano, 2017; Schipper & Spekkink, 2015). Some specific research gaps of knowledge integration have been pointed out. First, Mehta and Mehta (2018) have suggested a need for a more holistic assessment of knowledge integration in complex non-routine-based knowledge work. Second, knowledge integration should be studied more on the level of people and processes for understanding the relational characteristics

between individuals (Tell, 2011). In particular, there is a lack of empirically grounded research concerning knowledge-integration practices between individuals in collaborative processes (Tell et al., 2017), where individuals may act as gatekeepers (Messeni Petruzzelli et al., 2010) or knowledge brokers (Hargadon, 2002).

The paper's aim is to explore empirically the potentials of a mixed-methods approach based on a combination of social network analysis (SNA), interviews and focus group in order to analyse the dynamic social context of knowledge integration in planning processes. With this in mind, the added value of developing such research design allows a close collaboration with actual planning practice in order to achieve societal impact.

The paper is organized as follows. The next section gives an overview of the current understanding of the networked nature of planning processes, as well as the current state of methods for understanding the procedural dynamics. The third section outlines the methodological design and data of an ex-post evaluation of planning process in Finland. The fourth section presents findings in relation to the research questions. Finally, the contributions of the research are discussed. The last section concludes.

CURRENT UNDERSTANDING OF NETWORKED DYNAMICS AND RELATED METHODS

Owing to its collaborative nature, planning has been described as a social process that is strongly influenced by interpersonal relationships (Innes & Booher, 2016; Forester, 2008; Healey, 2007). In recent decades, planning has been understood as a complex adaptive system, as it unfolds through non-linear social dynamics over a long time scale (de Roo, 2012; Innes & Booher, 2010). Complex adaptive systems can learn from experiences over time (Rotmans et al., 2012), and their analysis has to acknowledge the dynamic nature of the system. In particular, the ability to change and learn in such complex adaptive systems depends on the information flows and knowledge co-creation between the networked actors (Innes & Booher, 2010). Consequently, the understanding of time and continuous change becomes critical, asking for a more process-oriented view of analysis. Thus, the analysis should find methods for revealing the temporal structures and patterns of actual procedural complexities (van de Ven, 1992). One possibility for understanding these actor-relational interactions in planning processes is to analyse their networked dynamics (Dempwolf & Lyles, 2012; Innes, 2005). The procedural aspects of planning have been discussed for decades (e.g., Chadwick, 1978; Faludi, 1973; Lindblom, 1959), also from a social point of view (Forester, 1999; Innes & Booher, 2010). However, reaching beyond static snapshots of the actual everyday dynamics of these knowledge-integration processes has received less attention, and their emergent dynamics over time have remained largely ignored and invisible. So far, the traditional empirical methods for analysing planning as a social process (e.g., interviews, surveys) have offered a variety of perspectives

of the individual planners act in the communicative contexts (e.g., Fischler, 2000; Healey, 1992; Hoch, 1994).

Despite these efforts, not much is known about the formation and development of complex social networks over time in the context of public administration processes. A combination of different methods should be customized for increasing the resolution of procedural dynamics from various aspects simultaneously (e.g., Dawson, 1997; Pettigrew, 1997). Consequently, process research should take a variety of routes (Langley, 1999), as a mixed-methods approach may decrease the risk for methodological inaccuracies. Analysis of the dynamic knowledge-integration networks may offer an opportunity for widening the understanding of planning processes, giving more weight to the inherent social interactions over time. Interest in studying public administration networks has increased in recent years (e.g., Isett et al., 2011; Kapucu et al., 2017; Lecy et al., 2014; Provan & Lemaire, 2012). The various networks have been studied, for example, for understanding the relation between knowledge transfer, information diffusion and learning capabilities in the networks (e.g., Perry-Smith & Shalley, 2003). Also in planning, a need for improving the understanding of the networked dynamics has been identified (Innes, 2005; Rydin, 2013). However, there are no established methods for representing the networked dynamics over time (Corsaro & Snehota, 2012), as research has so far focused mainly on static descriptions of networked structures (Isett et al., 2011). In addition, these kinds of process data have been very limited, which has been named as a reason for the lack of process research on network dynamics and evolution (Stokman & Doreian, 1997).

Considering the views that public administration research often fails to contribute to the practice, because the theory offers advice on a too general level, relying too much on the capacities of practitioners to turn these into action (e.g., Head, 2015; Isett et al., 2011; Newman, 2014; Rydin, 2013). The visual–analytical capabilities of SNA could bring new understanding also for practice-based development. However, in order to understand the reasoning behind the multidimensional and networked dynamics in practice, more descriptive methods need to be included in the research design. So far, limited emphasis has been put on systematic methodological combinations of analysing the everyday dynamics of planning practice (Birch, 2001; Fischler, 2000; Forester, 2012; Healey, 1992; Hoch, 1994). Practice-based research has offered a variety of insightful perspectives on the work of individual planners, but the actor-relational aspects remain still mainly unacknowledged.

In the context of planning, actor–network theory (ANT) is gaining popularity as a way of analysing networks on a variety of spatial scales (Cvetinovic et al., 2017; Fallan, 2011). In the view of ANT, social actions emerge through the integration of the social relations and the context-related non-human resources (Boelens, 2009). However, finding methods for understanding the actual social structures of planning networks is essential when the integration processes need to be analysed. Contrastingly, another

stream of network-focused research in planning is SNA, which is suitable for investigating and understanding the challenges of knowledge flows in complex knowledge-action networks. SNA was developed first as a way of thinking in sociology, identifying the importance of studying complex relations between social actors, and analysing the society through various social systems, but its possibilities have since been acknowledged in multiple other disciplines as well. In the context of planning, SNA has been used, for example, in the context of place-making and community development (Ganis et al., 2016; Zhao & Wang, 2018). However, a lack of empirical planning process research with SNA has been highlighted (Dempwolf & Lyles, 2012; Lyles, 2015). Instead of concentrating on the individual characteristics of actors, SNA considers the attributes as arising from their relational structures (for a more detailed methodological description, see Scott, 2017; and Wasserman & Faust, 1994). Berthod et al. (2017) have suggested that a mixed-methods approach may support the understanding of actual networked dynamics, as the networked structures cannot be completely abstracted from the actual lived histories (Crossley, 2010). Consequently, interest in using mixed methods for understanding processes of social networking has been growing (e.g., Bellotti, 2016; Bernhard, 2018; Bolíbar, 2016; Coviello, 2005). This paper addresses the need for developing mixed-methods approaches for understanding the multidimensionality of practice by proposing a research design that balances the well-established planning research methods (such as interviews, surveys, etc.) with visual–analytical SNA to bring in new perspectives for understanding the social context of knowledge-integration processes in practice.

METHODOLOGY

This paper introduces a mixed-methods research framework that tries to deal with the identified methodological development needs. First, the social dynamics of the knowledge-integration process were analysed with SNA. Second, the experienced reasons for and impacts of the structures were discussed with the process participants in individual interviews. Third, the applicability of the findings was discussed in focus group discussions with practising planners. Furthermore, in order to reach a stronger societal impact, special focus is put on crossing the identified gap between planning research and practice (e.g., Rydin, 2013). For this reason, the findings of this research were also tested in planning practice. Consequently, the research analyses two questions:

- What are the specific strengths and limitations of SNA as a part of a mixed-methods approach for understanding the social dynamics of the actual knowledge-integration processes in planning practice?
- How could SNA support or hinder the understanding and development of the knowledge-integration processes in practice?

The research uses an illustrative case as an example for generating an understanding of the possibilities of the introduced mixed-methods approach (for a more detailed description, see Eräranta, 2019). Such illustrative cases have been suggested to allow the analysis of holistic explanations in process settings better than other comparative methods (Flyvbjerg, 2006; Pettigrew, 1997). To understand the actual realities of planning practice, the research was carried out as a longitudinal empirical study, using detailed time-series data of organized actor interactions of a four-year statutory strategic spatial planning process in the Helsinki Capital Region, Finland. Planning is a central element in the Finnish urban development system, regulated mainly by the Land Use and Building Act (132/1999), which is currently being re-evaluated. Municipalities hold a planning monopoly, and decisions are made by a representative democracy, even though the role of the private sector has increased during the last few decades (Mäntysalo et al., 2011). Owing to the high societal relevance of public sector planning in Finland, and the related legislated communicative and interdisciplinary settings of these processes, the selected case is expected to provide a potentially interesting case for testing the SNA-based mixed-methods approach.

The research data consist of a database with processed raw data of the case, 11 transcriptions of individual interviews and four transcriptions of focus group interviews. The database (Figure 1) includes all documented process data, which were available after the process was finished. The raw data were provided for the research by the municipal planning organization, including 40.31 GB of digital process documentation (10,533 files) in addition to a smaller amount of handwritten and hand-drawn material. The raw data consist of decision-making related appendices, detailed plan-related data, formal decision documents, meeting agendas, meeting invitations, meeting memos, meeting notes, other background data, plan-related investigations, plan-related presentations, plan-related sketches, process management documents, resident collaboration-related data, spatial base data and thematic data in various formats. A part of the data was processed into a database of five interlinked longitudinal data sets (part 'a' in Figure 1) to provide systematic data of around 400 organized in-person interactions of the participants to be then further analysed with SNA. In the data set, the process participants were divided into various roles (municipal civil servant, landowner, elected official, consultant, public authority, developer) based on their organizational backgrounds. Furthermore, all organized meetings were categorized based on the specifically explicated themes of the meeting invitations. The altogether 15 themes were divided into the more universal procedural
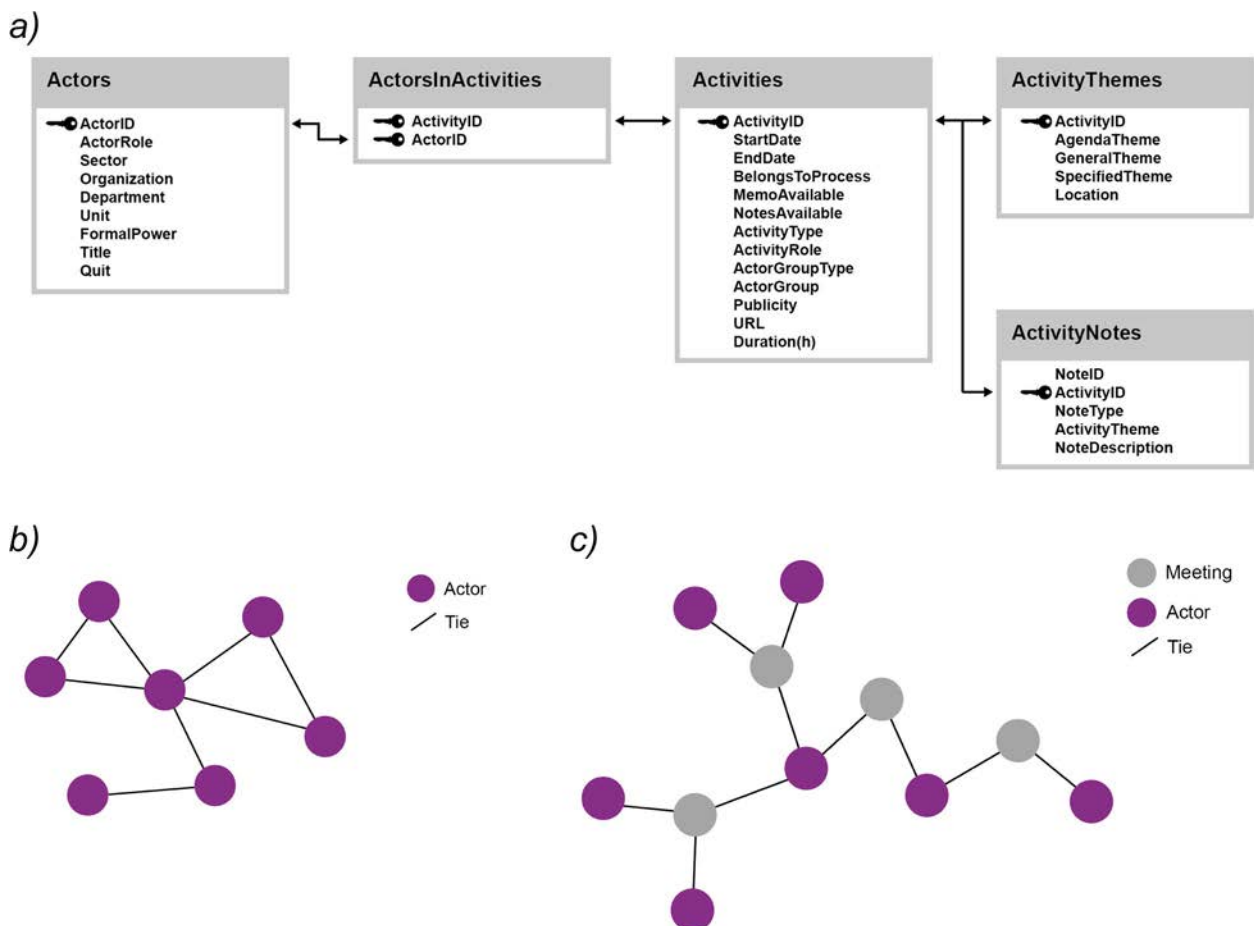

Figure 1. Contents of the meeting-based time-series data were divided into five interlinked data sets to provide information about the actors and the activities for the one-mode and affiliation network analyses.

themes (e.g., plan documentation, plan situation) and more substance-related sectoral themes (e.g., mobility, nature and recreation) to allow further analysis of inter-thematic knowledge integration during the process.

There are no established practices for decoding networked dynamics of planning processes, so in this research the data were classified into four subsequent periods according to the phases outlined in the Finnish planning regulation (Land Use and Building Act 132/1999): goal-setting (G_1–G_6), draft (D_1–D_4), proposal (P_1–P_9) and ratification (R_1–R_6) phases. These phases were then further divided into intervals of two months in order to increase the temporal resolution of the analysis. Furthermore, to take a closer look at the procedural dynamics with the actual networked structures, the draft phase (D_1–D_4) was selected to be illustrated with more detail. The draft phase is an important part of Finnish planning processes in general, as a first draft of the plan is completed and made available for public review during that specific phase. Consequently, in order to bring together the various thematic aspects of the process for the first time, knowledge integration is essential in the specific phase. The process data were later complemented with individual interviews of process participants. All data were anonymized to protect the research subjects from harm.

In the first part, the time-series data of the organized interactions was analysed with SNA to reveal the socio-temporal network structures. SNA examines the networked structures through nodes (here, the human actors and the discussed themes) and their ties (here, organized interactions in which the themes were discussed) by using various statistical measures (e.g., Knoke & Yang, 2008; McCulloh et al., 2013; Scott, 2017; Wasserman & Faust, 1994). In order to understand knowledge integration, two types of networks were analysed: one-mode and affiliation. First, one-mode networks consist of only one type of actors and their ties to understand the relational attributes of their social interactions (part b in Figure 1). In this research, a tie is formed between two nodes when the actors have participated in the same organized meeting during the analysed process. In the one-mode network graphs, the size of the nodes represents the nodes' relational power concerning information transfer, and the strength of ties represents the intensity of the tie between the two nodes (i.e., how often they participated in a same meeting).

Second, affiliation networks connect two different sets of nodes, in this research the actors and the thematized meetings in which they attended (part c in Figure 1). In the two-mode network graphs, the size of the nodes represents the number of individuals participating in a specific theme, and the strength of ties represents the intensity (i.e., how many times an actor has participated in the meetings of a certain theme). The software used for the SNA was Gephi 0.9.1, which allows the simultaneous analysis and visualization of the data sets by using a list of nodes and their ties. For the visual placement of the nodes and ties, the Fruchterman–Reingold algorithm (Fruchterman & Reingold, 1991) was used in the one-mode analyses, and the Force Atlas algorithm (Cherven, 2013) in the thematic affiliation analyses. Both are commonly used algorithms for force-based visualizations, using force-directed placement by pulling together nodes with stronger ties, affecting the locations of the nodes and their ties in the network graphs.

In this research, two measures were used to analyse the networked dynamics of thematic knowledge integration. First, the one-mode network of social actors and their ties was analysed with *betweenness centrality* (BC). It is an important measure for analysing information transfer in the process (Borgatti, 2005), as it describes an actor's ability to control the other actors' access to all parts of the network, and thus the ability to influence the information flows, or act as a gatekeeper (Messeni Petruzzelli et al., 2010). If the knowledge flows can easily be manipulated or biased by few central actors, the reasoning and credibility of the plan may be challenged. BC can be calculated per node k as a sum of ratios of geodesic paths from node i to node j, and the number of shortest paths from node i to node j, passing through node k (Borgatti, 2005). The average BC scores were calculated for each phase of the process. In addition, the standard deviation was calculated to complement the analysis with the potential differences between individual actors.

Most of the measures in SNA are developed for one-mode networks, and the affiliation networks need to be transformed into one-mode for enabling their analysis. Consequently, a *thematic in-degree* (TID) analysis was used to link the actors and themes into an affiliation network (Latapy et al., 2008) to analyse the actual thematic contents of the process (Pettigrew, 1997). The in-degree of a node, $d_I(n_i)$, is the number of nodes that are adjacent to n_i, that is, the number of ties ending at n_i (Wasserman & Faust, 1994, p. 126). In the analysis, the directed ties go from the actors to the meetings, representing their attendance in the various themes during the phases. Moreover, the percentages of actors participating in only one theme or in all themes were analysed for showing the actor-level possibilities of acquiring information of various themes. The thematic analysis is important for understanding the information flow between the various themes, which should be integrated in the process.

Despite that SNA can help to disclose the connections and relational spaces of complex networks, for understanding structural features of networks (e.g., size, centrality and relational positions of individuals), it also has limitations. First, as a form of quantitative analysis, SNA is more capable of revealing the form of networks (Schipper & Spekkink, 2015), lacking the explanatory capabilities of their meaning in the social processes. Second, when studying dynamic processes over time, SNA requires systematic and detailed time-series data, which allows the recollection of interactions beyond actor memories. Third, the application of SNA requires exact identification of the nodes and their ties for constructing a network. When mixed with more descriptive methods, the reasoning and explanations behind the network structures can be better understood. For example, while SNA can support the understanding of which individuals are central in the knowledge-integration processes, more descriptive

methods (such as interviews and focus groups) can reveal how the positions were formed in the first place. Consequently, the SNA findings were analysed through a series of 11 semi-structured (Gillham, 2005) individual interviews with actors who had participated in the analysed process. The interviewees were selected based on their intensity of involvement in the planning process for ensuring their breadth of experience in the process. The interview protocol was divided into two parts: questions about the retrospective memories of the process before showing the SNA findings, followed by a series of questions to validate the SNA findings. Part of the questions were linked to allow the comparison of the memory- and SNA-based findings in order to analyse the possible complementarity of the methods. The interviews were used for an in-depth analysis to investigate further the participants' actual experiences of knowledge integration in the planning process. Finally, four focus group interviews (Morgan, 1996) with practising planners were made to discuss the practice-related applicability of the SNA analysis.

FINDINGS

Procedural knowledge-integration dynamics

The average BC varied from zero to 184.92 during the process, because the network structures varied continuously (for an illustration of the network structures for the whole process, see Eräranta, 2019). In addition, the scores varied considerably between actors, and the standard deviation increased especially when the large groups of elected officials participated at the end of proposal and ratification phases causing more variance in the relational information manipulation capabilities of the participants. In most phases, the network structure was strongly centralized, with considerably high BC scores for only one or two actors (e.g., phases D_1, D_2 and D_4 in Figure 2). In addition, the BC of different actor roles varied considerably during the process, increasing for the consultants, developers and landowners in the beginning and for the elected officials in the end of the process. The BC of the municipal civil servants was substantially high during the whole process.
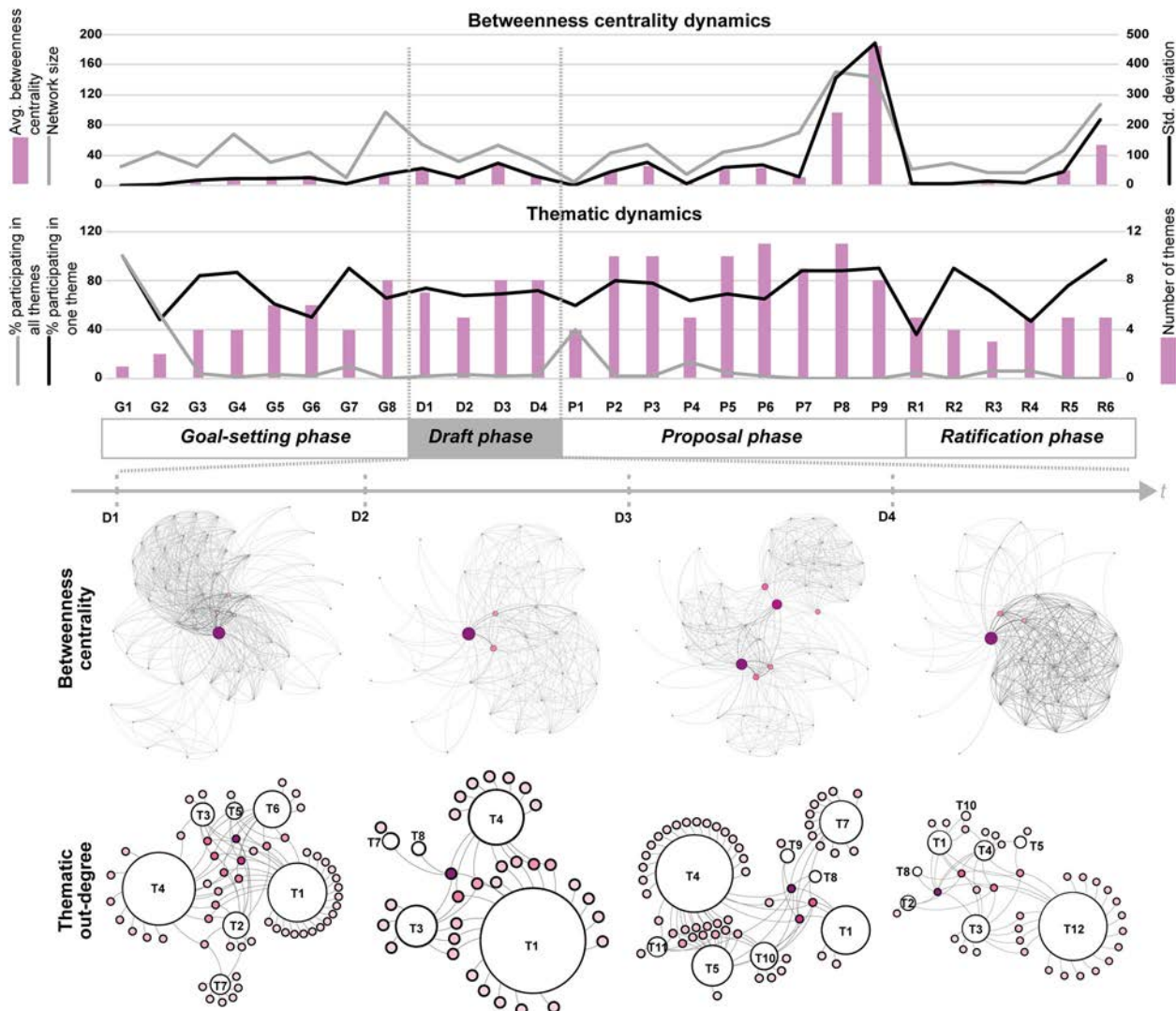

Figure 2. Variation of betweenness centrality and thematic dynamics as collective multilevel weaving of experiences around the knowledge-integration practices.

The considerably centralized position of one specific participant (seen in phases D_1, D_2 and D_4 in Figure 2) was explicitly named in the interviews as central for most of the information transfer, as well: 'That person had been there since the beginning and knew everyone involved. … The stakeholders knew that actor, so it was easy for them to contact that actor.' In addition, some interviewees pointed out the importance and challenges of having a broader core team at times (seen in phase D_3 in Figure 2): 'I would say that the core team was taking care of the information transfer. … I guess there were typical information challenges involved.' Based on the findings, the information transfer structure was strongly centralized, affecting the participants' position for retrieving diverse information through organized meetings.

Information transfer in the organized meetings was further challenged by the usually limited number of participants. Furthermore, the meetings mainly focused on an individual theme decreasing possibilities for information exchange and knowledge integration between themes. Consequently, the cumulative TID, and the intensity of ties between the various themes, varied considerably. This suggests that the number of participants for the different themes varied much, and knowledge integration between themes was allocated to few specific actors. Typically the procedural themes were comparatively well connected to other themes, whereas the sectoral themes were more weakly connected with each other, suggesting that intersectoral knowledge integration in the organized meetings was not firmly established. As Figure 2 illustrates, most actors participated in only one theme during a phase, and typically there was only one, or no, actor connecting all themes. The situation stayed similar for the whole process duration. Over half the actors participated in only one (out of 15) theme during the process, and none of the actors participated in all of the themes in all phases. These findings were in line with the interviews. Typically the interviewees were able to describe only the themes in which they had participated, and many of the claimed not to have a holistic view of the whole process: 'I do not remember any meetings with other people than the core team.' According to the interviews, it is typical for planning processes that the sectoral themes are discussed separately, and the sectoral experts are not involved in the integration of all themes, as was described by one interviewee as: 'I do not even know what themes were involved.'

In order to take a closer look at BC in relation to knowledge integration between the different themes, the draft phase (D_1–D_4 in Figure 2) is used to serve as a more detailed example. In D_1, representatives of the environmental themes entered the process, and some representatives of the landowner organizations exited the process. The network structure was balanced, and there was one central actor bridging together all subnetworks and the more peripheral actors at the fringes of the network. A total of 74% of the actors participated in only one theme, and only one actor participated in all seven themes during the phase. Consequently, most responsibility of the overall knowledge integration was left to this individual actor, and the themes were relatively weakly connected. In D_2, the network structure had one central actor and diverse theme-specific subnetworks. A total of 68% of the actors participated in only one theme, and only one actor participated in all five themes. Some themes were linked relatively strongly together, but all themes were connected weakly together. In D_3, consultant-made thematic investigations were commenced and finalized. In addition, representatives of various themes (e.g., public services, nature and recreation) entered the process. The network structure was divided into multiple subnetworks with a central team of individual actors linking the different parts of the network together. A total of 69% of the actors participated in only one theme, and only one actor in all eight themes. Most of the themes were weakly connected together. In D_4, various thematic investigations were finalized. The elected officials can be seen as a clear subnetwork, as they joined the process to decide on setting the plan draft for public review. The network had a clear subnetwork in addition to some more peripheral actors, who were linked together by a central actor. A total of 72% of the actors participated in only one theme, and only one actor participated in all eight themes. Consequently, the connections between the themes remained weak during the whole draft phase.

In order to provide additional understanding of the actual knowledge-integration process, a closer analysis of expert interviews was carried out. During the first part of the interviews, before the SNA findings were shown, it became clear that the participants had scarce and strongly sectoral memories of the process. In the second part of the interviews, the participants were then able to reflect on their knowledge-integration related experiences with the support of the network graphs. According to the interviews, the information exchange was typically related only to the specific theme, which an actor was directly responsible for without allowing broader knowledge integration between the themes. This led to individual and process-level challenges of developing holistic understanding of the process and the substance:

> There was not a clear understanding of the sectoral inter-relations, because they were always treated separately. We did not sit around the same table to discuss. … When there were no shared meetings, I have no idea of how my theme was treated.

In case an actor had worked with only one sectoral theme, the information exchange was related mainly to that specific theme, challenging the overall understanding of the plan situation and solution.

The process-related experiences of knowledge integration were connected to multiple levels from the individual or actor-relational dynamics to the institutional settings. On the *institutional level*, organizational rules, routines and traditions were told to affect the knowledge-integration patterns during the process. Furthermore, according to the interviews, the networked structures were affected by informal organizational barriers, where

the actors felt restricted to collaborate with actors on certain hierarchical levels due to organizational culture:

> I cannot ask directly from someone, because he is some steps higher in the hierarchy than I am. Therefore, I have to ask from someone closer to my own level of hierarchy. Even as the one higher up would be the one having the information that I need.

In addition, organizational traditions were described to have affected especially the interorganizational collaboration. Moreover, it was described that the institutional culture of public administration organizations in general does not typically have established traditions to support need-based networking, but follows strictly hierarchical practices, decreasing possibilities of knowledge integration: 'If we make a strict pyramid organization or another kind of hierarchical structure … it can prevent collaboration.' According to the interviews, part of the networked structures were affected by the number of simultaneously ongoing processes, as the sectoral experts are typically expected to participate in multiple processes simultaneously. Thus, the participants' intensity of involvement in individual processes decreased. Moreover, interviewees suggested that the sectoral themes are usually brought into planning processes too late and only randomly. Moreover, sectoral themes were described to be considered merely as restrictions, whereas the discussion should have commenced already earlier to allow holistic understanding of the solutions.

On the *actor-relational level*, the networked structures were partly explained by previously established personal relations. As suggested by the interviewees, it takes time to establish fluent collaboration. As suggested, this may lead to the desire to cooperate more with previously known actors instead of the ones who would actually be the most needed for knowledge integration. Moreover, it was explained that due to negative experiences in previous processes, there was an aim for avoiding confrontations with some actors. Sometimes this led to decisions to withdraw from the process, if challenges were anticipated. Moreover, the networked structures were influenced by the actors' desire to find support from shared backgrounds for deepening their expertise of the sector-specific themes. On the contrary, not having contact with other sectoral experts in the process caused also distrust. When the actors did not have a possibility to meet each other and develop shared understanding of their sectoral views, their feeling of distrust increased:

> I could not describe it as a process, as the procedural information never reached the sectoral experts. … After you have prepared something in collaboration with your own subnetwork, you are suddenly expected to do something completely different. And then someone is cutting the ground under your feet … .

Thus, the experiences extended beyond the lack of sectoral and temporal knowledge integration, touching the trust-and emotion-related sides of the processes. As one of the interviewees pointed out, in addition to understanding collaboration, it is also important to understand 'what may happen when one does not let the humans collaborate with each other'. More specifically, the temporality and randomness may lead the participants to feel distrust towards the central actors, and all others, when they are not adequately informed of what was going on.

On the *individual level*, the interviewees explained that the intensity of involvement in the sectorally bound networks was partly dependent on the actors own activity of demanding to be informed, and on the intentional decisions to leave some actors out: 'Not everyone needs to be equally aware of everything, because there is so much information.' Based on the interviews, the intentional information withholding was partly aimed at giving the actors an opportunity to focus only on their own direct sectoral responsibilities. If an actor worked with a specific sectoral theme, the information exchange was related mainly to that specific theme, and the actor was not given the possibility to interact with other experts, which reduced the possibilities of shared knowledge integration. In addition, personal values, emotions, motivational factors and personalities were mentioned in relation to the individual level.

Developing understanding of knowledge-integration practices with mixed methods

All the interviewees and focus group participants had diverse experience of various planning processes, but many were surprised of the diversity and breadth of dynamics in the specific process, when it was analysed and visualized with SNA: 'I have not perceived all that is happening in a planning process.' Some interviewees pointed out that planning processes are not understood currently well enough in practice: 'There is no understanding [of processes] at the moment'; and 'Now it is like wandering around in the shadows. You kind of see a figure, but you do not recognize what it is.' Generally, all interviewees agreed on the need for developing process understanding in planning practice: 'People should have a much wider understanding of it [planning process].' Some interviewees explicitly indicated that also the processes should be developed: 'We have very much need for process development.' Especially, understanding of the relation between process and substance varies, and some interviewees even suggested that there is no relation: 'The process is not necessarily guiding the work. For example, why some plan is as it is, is not necessarily because of a process that was followed.' Some interviewees, on the other hand, suggested that the contents of a plan are strongly dependent on the process that was followed. Some interviewees pointed out that the discussion of planning processes is typically strongly institutional, and does not support the understanding of individual and actor-relational dynamics in these processes.

Thus, SNA was considered as a good way for making the meaning of social dynamics in these knowledge-integration processes visually understandable to open up discussion of process development needs. According to the

interviewees, these kinds of analyses are needed to support process understanding in practice by dividing the long process into understandable phases to point out the effects of the various process structures. Many interviewees considered that they had learned something new of the specific planning process, or processes in general, through the SNA findings: 'These figures and everything … it supports understanding.' The more the interviewees had participated in the meetings during the process, the less surprised they were, but still considered the analyses as a good way of summarizing the process, and learning for subsequent processes: 'I think these graphs would help all planners to understand. This should be done of every process.' Another interviewee suggested that the analyses could further support the planners in understanding the overall complexities of the processes: 'I think the planners can also be blinded by the process. … Revealing the interrelations within the process could help them', and 'I think this approach and method visualizes the interactional relations really well.' Considering the ability of learning about the effects of the different network structures, one interviewee pointed out that 'It is good to identify various network structures in the processes. Some of them are really vulnerable.' This worry was specifically pointed out in relation to the strongly centralized knowledge-integration structures, which may decrease organizational and procedural capabilities of holistic understanding.

DISCUSSION

The findings suggest a methodological contribution for planning research and practice. Previous process research has suggested that process analysis should include a combination of methods to support the analysis (Dawson, 1997; Langley, 1999; Pettigrew, 1997), and to go beyond the typically static descriptions of networks (Isett et al., 2011). Based on the findings, the suggested mixed methods approach may add value to research on planning practice by combining the networked structures with more descriptive understanding of the related experiences over time. With systematic and longitudinal data, SNA allows structural analysis of overall knowledge-integration practices, going beyond the memories of individual actors, which are prone to post-rationalization and memory distortion (Corsaro & Snehota, 2012). Similar to previous research (e.g., Berthod et al., 2017; Bidart & Lavenu, 2005; Crossley, 2010; Heath et al., 2009), the findings here indicate that the combination of SNA and interviews allows a more detailed understanding of the reasoning behind and experienced effects of the networked knowledge (un)integration structures. SNA supports the understanding of the actual network structures and the relational positions of individuals in them, whereas interviews enable understanding of the reasoning behind and the impacts of the structures. Moreover, comparison of the interview findings before and after showing the SNA findings revealed the scarcity and imprecision of procedural memories that can be revealed by relying solely on memory-dependent methods, such as interviews. When combined with SNA findings, the procedural memories got more depth and precision, as the interviewees were able to go back to the temporal sequences of the specific process. Thus, the graph visualizations were easily understandable and insightful for the interviewees. Even if the interviewees did not have previous experience with network graphs, they were able to reconstruct some of their memories of the process by identifying certain actors or activities in the graphs.

In order to answer the previously identified lack of methods for revealing the often invisible everyday dynamics over time (Isett et al., 2011; Schipper & Spekkink, 2015), and the lack of empirical planning process research with SNA (Dempwolf & Lyles, 2012; Lyles, 2015), the suggested research design in this research increased the scope of insights into the social and sectoral realities of planning practice over time. To develop new perspectives into the previously identified needs for understanding networked dynamics of planning (Innes, 2005; Rydin, 2013), the research findings suggest methodological contributions for diving into the nested dynamics of planning-related networks. The findings suggest that thematic knowledge integration in planning is strongly influenced by a variety of interrelated and multilayered aspects, which have not been extensively discussed in the integrated planning frameworks so far. The experiences related to the networked dynamics of thematic knowledge integration were not only influenced by institutional settings, but also by actor-relational and individual level factors. Consequently, planning needs to be understood in its social context instead of as a mechanical sequence of activities in institutional settings. Thematic knowledge integration in planning is done in the interaction of individuals with contradictory values and views, so methods for developing a deeper understanding of the actor-relational level are needed. Thus, understanding the actual everyday context of planning – the planning *in situ* – is important. Based on the findings, the everyday stage of integrated planning is influenced by the constantly changing interaction between institutional factors and the social fabric of the interrelated social actors. The institutional settings involve a range of factors from organizational rules, routines and traditions, institutional culture, multiplicity and resource-dependency of simultaneously ongoing processes, administrative separation of projects, and adhocracy of needs to the informal barriers of collaboration. The social fabric contains both individual-level and actor-relational aspects. The actor-relational aspects include personal relations, avoidance of confrontations, support from shared background, and distrust, whereas the individual-level aspects range from actor's own activity of requesting information to individual expertise, values, emotions, motivational factors and personalities. The everyday settings create a frame for how the actors relate and devote themselves to the specific processes over time, affecting the premises of knowledge integration and learning in the processes.

Moreover, previous research has addressed the need for strengthening the collaboration between research and practice for reaching more direct societal impact (Head, 2015; Isett et al., 2011; Newman, 2014; Rydin, 2013). As the

second key contribution of this research, the introduced research design allowed direct iteration between research and practice already during the research process, supporting reflective learning, process development and societal impact. Thus, SNA not only improves the understandability and communicability of the results but also supports reflective learning from the typically invisible and undiscussed perspectives of knowledge-integration processes on practice side. One strength of SNA is the ability to use graph visualization techniques in identifying the patterns and unexpected structures in the networks. Despite of its benefits, SNA-based methodological combinations also have limitations, especially concerning longitudinal process research over multiple years. As has been pointed out in previous research, the lack of applicable process data has decreased the opportunities for studying networked dynamics over time (Stokman & Doreian, 1997). The findings of the research are in line with previous research, suggesting that SNA-based longitudinal time-series analyses are indeed strongly dependent on the data used in the analyses. For allowing the statistical analyses, SNA requires a detailed and standardized set of data with identifiable nodes and their relations. However, the research also suggests that collecting the needed process data is possible, and can be well applied in a mixed-methods approach. In order to understand the temporal structure of the processes, it is essential to preserve the temporal interconnectedness of data. Thus, SNA research is typically challenged by the resource dependency. In a complex and long-lasting process, the need for vast data is directly being challenged with typically unsystematic documentation of planning processes in practice. In addition, the utilization of process data afterwards is currently challenging, and requires much manual work to be applicable for SNA. Moreover, access to process data is dependent on functioning collaboration and building of trust between research and planning organizations. Despite the limitations, the findings have implications for planning research and practice, offering tools for understanding the inherent complex dynamics of networked planning processes over time.

Thus, the visual and easily understandable nature of SNA findings allows the application of SNA for directly practice-related process development purposes. In addition to retrospective process analyses, SNA may also serve as a method for evaluating processes simultaneously as they unfold. Consequently, *the findings suggest a methodological contribution both for planning research and practice*. This work serves as a starting point for uncovering the actual relational dynamics of knowledge integration in planning processes with a suggested methodological combination. In order to develop the SNA-based methodological combination further to allow the interlinked statistical structural and descriptive in-depth analysis, more comparative studies with varying phasing of process data are needed. Based on the findings, further research for understanding how the revealed social relationships are structured and conditioned becomes central. In addition, such development should be supported by the development of data collection standards

for time-series with identifiable nodes and their specified relations, and using additional validation methods, such as focus groups or plan evaluation. Simultaneously with methodological development, there is a need for further deepening of conceptual frameworks focused on human-scale experiences in everyday realities of planning practice. In conclusion, unveiling the networked dynamics in planning research is a promising direction for further understanding of human-scale experiences in planning processes of place-making and place-shaping.

CONCLUSIONS

The overall aim of the paper was to evaluate empirically test a SNA-based methodological combination to support the research and practice based understanding of knowledge-integration dynamics in planning processes. Owing to its relational nature, it was expected that SNA, including a range of various measures, and when added into the methodological combination, could have potential of studying knowledge-integration processes, which are necessary for sustainable urban development. Providing depth to the previous claims about the non-linear, complex and social nature of planning, findings inform us that planning processes evolve through various social and institutional contexts over time. The everyday '*in situ*' realities of planning are influenced by the continuously changing interaction of the institutional rules and the social fabric of the organizational practices, influencing how the participants orient themselves in these complex processes. In particular, the findings suggest that social dynamics of a planning process over time can be more complex than the more atemporal and linear methods have suggested previously. Having in mind the need for generating new understanding of the temporal dynamics of knowledge integration, SNA combined with in-depth qualitative methods has potential for visually and statistically uncovering multidimensional understanding of the longitudinal complexities of planning practice. Specifically, SNA allows the analysis of both actor-relational and thematic networks, widening the view from social dynamics to the actual knowledge integration between the various themes which were discussed during the process. When combined with participant interviews, the multilayered experiences related to the networked structures can also be understood. The complementarity of SNA and participant interviews allows the generation of longitudinal statistical and visual understanding of the networked knowledge-integration dynamics, as well as of the experiences, which are entangled with the unfolding institutional and social settings of the process, supporting the understanding of complexities beyond linear and reductionistic cause and effect chains.

ACKNOWLEDGEMENTS

DISCLOSURE STATEMENT

FUNDING

ORCID

Susa Eräranta ⓘ http://orcid.org/0000-0003-0404-3748
Miloš Mladenović ⓘ http://orcid.org/0000-0002-3746-3573

REFERENCES

Balducci, A., & Mäntysalo, R., eds. (2013). *Urban planning as a trading zone*. Springer.

Bellotti, E. (2016). Qualitative methods and visualizations in the study of friendship networks. *Sociological Research Online*, 21(2), 198–216. https://doi.org/10.5153/sro.3936

Bernhard, S. (2018). Analyzing meaning-making in network ties – A qualitative approach. *International Journal of Qualitative Methods*, 17(1), Article 1609406918787103. https://doi.org/10.1177/1609406918787103

Berthod, O., Grothe-Hammer, M., & Sydow, J. (2017). Network ethnography: A mixed-method approach for the study of practices in interorganizational settings. *Organizational Research Methods*, 20(2), 299–323. https://doi.org/10.1177/1094428116633872

Bidart, C., & Lavenu, D. (2005). Evolutions of personal networks and life events. *Social Networks*, 27(4), 359–376. https://doi.org/10.1016/j.socnet.2004.11.003

Birch, E. L. (2001). Practitioners and the art of planning. *Journal of Planning Education and Research*, 20(4), 407–422. https://doi.org/10.1177/0739456X0102000403

Boelens, L. (2009). *The urban connection: An actor–relational approach to urban planning*. 010.

Bolíbar, M. (2016). Macro, meso, micro: Broadening the 'social' of social network analysis with a mixed methods approach. *Quality and Quantity*, 50(5), 2217–2236. https://doi.org/10.1007/s11135-015-0259-0

Booher, D. E., & Innes, J. E. (2002). Network power in collaborative planning. *Journal of Planning Education and Research*, 21(3), 221–236. https://doi.org/10.1177/0739456X0202100301

Borgatti, S. P. (2005). Centrality and network flow. *Social Networks*, 27(1), 55–71. https://doi.org/10.1016/j.socnet.2004.11.008

Chadwick, G. (1978). *A systems view of planning. Towards a theory of the urban and regional planning process* (2nd ed.). Pergamon.

Cherven, K. (2013). *Network graph analysis and visualization with Gephi*. Packt.

Contractor, N. S., & Monge, P. R. (2002). Managing knowledge networks. *Management Communication Quarterly*, 16(2), 249–258. https://doi.org/10.1177/089331802237238

Corsaro, D., & Snehota, I. (2012). Perceptions of change in Business relationships and networks. *Industrial Marketing Management*, 41(2), 270–286. https://doi.org/10.1016/j.indmarman.2012.01.002

Coviello, N. E. (2005). Integrating qualitative and quantitative techniques in network analysis. *Qualitative Market Research*, 8(1), 39–60. https://doi.org/10.1108/13522750510575435

Crossley, N. (2010). The social world of the network. Combining qualitative and quantitative elements in social network analysis. *Sociologica*, 4(1). doi:10.2383/32049

Cvetinovic, M., Nedovic-Budic, Z., & Bolay, J. C. (2017). Decoding urban development dynamics through actor–network methodological approach. *Geoforum; Journal of Physical, Human, and Regional Geosciences*, 82, 141–157. https://doi.org/10.1016/j.geoforum.2017.03.010

Davoudi, S. (2015). Planning as practice of Knowing. *Planning Theory*, 14(3), 316–331. https://doi.org/10.1177/1473095215575919

Dawson, P. (1997). In at the deep end: Conducting processual research on organisational change. *Scandinavian Journal of Management*, 13(4), 389–405. https://doi.org/10.1016/S0956-5221(97)00025-0

de Roo, G. (2012). Spatial planning, complexity and a world 'out of equilibrium': Outline of a non-linear approach to planning. In G. de Roo, J. Hillier, & J. van Wezemael (Eds.), *Complexity and planning: Systems, assemblages and simulations* (pp. 141–176). Routledge.

Dempwolf, C. S., & Lyles, L. W. (2012). The uses of social network analysis in planning: A review of the literature. *Journal of Planning Literature*, 27(1), 3–21. https://doi.org/10.1177/0885412211411092

Enberg, C., Lindkvist, L., & Tell, F. (2006). Exploring the dynamics of knowledge integration: Acting and interacting in project teams. *Management Learning*, 37(2), 143–165. https://doi.org/10.1177/1350507606063440

Eräranta, S. (2019). *Memorize the dance in the shadows? Unriddling the networked dynamics of planning processes through social network analysis* [Doctoral dissertation]. Aalto University.

Fallan, K. (2011). Architecture in action: Traveling with actor–network theory in the land of architectural research. *Architectural Theory Review*, 16(2), 184–200. https://doi.org/10.1080/13264826.2011.601545

Faludi, A. (1973). *Planning theory*. Pergamon.

Fischler, R. (2000). Case studies of planners at work. *Journal of Planning Literature*, 15(2), 184–195. https://doi.org/10.1177/08854120022092980

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219–245. https://doi.org/10.1177/1077800405284363

Forester, J. (1999). *The deliberative practitioner: Encouraging participatory planning processes*. MIT Press.

Forester, J. (2008). Understanding planning practice. In J. Hillier & P. Healey (Eds.), *Contemporary movements in planning theory* (pp. 35–76). Routledge.

Forester, J. (2012). Learning to improve practice: Lessons from practice stories and practitioners' own discourse analyses (or why only the loons show up). *Planning Theory and Practice*, 13(1), 11–26. https://doi.org/10.1080/14649357.2012.649905

Fruchterman, T. M., & Reingold, E. M. (1991). Graph drawing by force-directed placement. *Software: Practice and Experience*, 21(11), 1129–1164. https://doi.org/10.1002/spe.4380211102

Ganis, M., Minnery, J., & Mateo-Babiano, I. (2016). Planning people–places: A small world network paradigm for masterplanning with people in mind. *Environment and Planning B: Planning and Design*, 43(6), 1075–1095. https://doi.org/10.1177/0265813515602260

Gillham, B. (2005). *Research interviewing. The range of techniques*. New York Open University Press.

Graute, U. (2016). Local authorities acting globally for sustainable development. *Regional Studies*, 50(11), 1931–1942. https://doi.org/10.1080/00343404.2016.1161740

Hargadon, A. B. (2002). Brokering knowledge: Linking learning and innovation. *Research in Organizational Behavior*, 24, 41–85. https://doi.org/10.1016/S0191-3085(02)24003-4

Head, B. W. (2015). Relationships between policy academics and public servants: Learning at a distance? *Australian Journal of Public Administration*, 74(1), 5–12. https://doi.org/10.1111/1467-8500.12133

Healey, P. (1992). A planner's day: Knowledge and action in communicative practice. *Journal of the American Planning Association*, 58(1), 9–20. https://doi.org/10.1080/01944369208975531

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. Macmillan.

Healey, P. (2007). *Urban complexity and spatial strategies: Towards a relational planning for our times*. Taylor & Francis.

Healey, P., & Shaw, T. (1993). Planners, plans and sustainable development. *Regional Studies*, 27(8), 769–776. https://doi.org/10.1080/00343409312331347955

Heath, S., Fuller, A., & Johnston, B. (2009). Chasing shadows: Defining network boundaries in qualitative social network analysis. *Qualitative Research*, 9(5), 645–661. https://doi.org/10.1177/1468794109343631

Hoch, C. (1994). *What planners do: Power, politics, and persuasion*. American Planning Association.

Holden, M. (2012). Is integrated planning any more than the sum of its parts? *Considerations for Planning Sustainable Cities. Journal of Planning Education and Research*, 32(3), 305–318. https://doi.org/10.1177/0739456X12449483

Hrelja, R. (2015). Integrating transport and land-use planning? How steering cultures in local authorities affect implementation of integrated public transport and land-use planning. *Transportation Research Part A: Policy and Practice*, 74, 1–13. https://doi.org/10.1016/j.tra.2015.01.003

Huang, J. C., & Newell, S. (2003). Knowledge integration processes and dynamics within the context of cross-functional projects. *International Journal of Project Management*, 21(3), 167–176. https://doi.org/10.1016/S0263-7863(02)00091-1

Hull, A. (2008). Policy integration: What will It take to achieve more sustainable transport solutions in cities? *Transport Policy*, 15(2), 94–103. https://doi.org/10.1016/j.tranpol.2007.10.004

Innes, J. E. (2005). Networks and planning thought. In L. Albrechts & S. Mandelbaum (Eds.), *The network society: A new context for planning* (pp. 57–61). Routledge.

Innes, J. E., & Booher, D. E. (2010). *Planning with complexity: An introduction to collaborative rationality for public policy*. Routledge.

Innes, J. E., & Booher, D. E. (2016). Collaborative rationality as a strategy for working with wicked problems. *Landscape and Urban Planning*, 154, 8–10. https://doi.org/10.1016/j.landurbplan.2016.03.016

Isett, K. R., Mergel, I. A., LeRoux, K., Mischen, P. A., & Rethemeyer, R. K. (2011). Networks in public administration scholarship: Understanding where we are and where we need to go. *Journal of Public Administration Research and Theory*, 21(Suppl. 1), i157–i173. https://doi.org/10.1093/jopart/muq061

Kapucu, N., Hu, Q., & Khosa, S. (2017). The state of network research in public administration. *Administration and Society*, 49(8), 1087–1120. https://doi.org/10.1177/0095399714555752

Knoke, D., & Yang, S. (2008). *Social network analysis*. SAGE.

Koglin, T. (2015). Organisation does matter – Planning for cycling in Stockholm and Copenhagen. *Transport Policy*, 39, 55–62. https://doi.org/10.1016/j.tranpol.2015.02.003

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, 24(4), 691–710. https://doi.org/10.5465/amr.1999.2553248

Latapy, M., Magnien, C., & Del Vecchio, N. (2008). Basic notions for the analysis of large two-mode networks. *Social Networks*, 30(1), 31–48. https://doi.org/10.1016/j.socnet.2007.04.006

Lecy, J. D., Mergel, I. A., & Schmitz, H. P. (2014). Networks in public administration: Current scholarship in review. *Public Management Review*, 16(5), 643–665. https://doi.org/10.1080/14719037.2012.743577

Lindblom, C. E. (1959). The science of 'muddling through'. *Public Administration Review*, 19(2), 79–88. https://doi.org/10.2307/973677

Lyles, W. (2015). Using social network analysis to examine planner involvement in environmentally oriented planning processes led by non-planning professions. *Journal of Environmental Planning and Management*, 58(11), 1961–1987. https://doi.org/10.1080/09640568.2014.973478

Majchrzak, A., More, P. H., & Faraj, S. (2012). Transcending knowledge differences in cross-functional teams. *Organization Science*, 23(4), 951–970. https://doi.org/10.1287/orsc.1110.0677

Mäntysalo, R., Saglie, I. L., & Cars, G. (2011). Between input legitimacy and output efficiency: Defensive routines and agonistic reflectivity in Nordic land-use planning. *European Planning Studies*, 19(12), 2109–2126. https://doi.org/10.1080/09654313.2011.632906

McCulloh, I., Armstrong, H., & Johnson, A. N. (2013). *Social network analysis with applications*. Wiley.

McIver, D., Fitzsimmons, S., & Lengnick-Hall, C. (2019). Integrating knowledge in organizations: Examining performance and integration difficulties. *Knowledge Management Research and Practice*, 17(1), 14–23. https://doi.org/10.1080/14778238.2018.1538667

Mehta, A., & Mehta, N. (2018). Knowledge integration and team effectiveness: A team goal orientation approach. *Decision Sciences*, 49(3), 445–486. https://doi.org/10.1111/deci.12280

Messeni Petruzzelli, A., Albino, V., Carbonara, N., & Rotolo, D. (2010). Leveraging learning behavior and network structure to improve knowledge gatekeepers' performance. *Journal of Knowledge Management*, 14(5), 635–658. https://doi.org/10.1108/13673271011074818

Morgan, D. L. (1996). Focus groups. *Annual Review of Sociology*, 22(1), 129–152. https://doi.org/10.1146/annurev.soc.22.1.129

Moynihan, D. P., & Landuyt, N. (2009). How do public organizations learn? Bridging cultural and structural perspectives. *Public Administration Review*, 69(6), 1097–1105. https://doi.org/10.1111/j.1540-6210.2009.02067.x

Newman, J. (2014). Revisiting the 'two communities' metaphor of research utilisation. *International Journal of Public Sector Management*, 27(7), 614–627. https://doi.org/10.1108/IJPSM-04-2014-0056

Okhuysen, G. A., & Eisenhardt, K. M. (2002). Integrating knowledge in groups: How formal interventions enable flexibility. *Organization Science*, 13(4), 370–386. https://doi.org/10.1287/orsc.13.4.370.2947

Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, 28(1), 89–106. https://doi.org/10.5465/amr.2003.8925236

Pettigrew, A. M. (1997). What is a processual analysis? *Scandinavian Journal of Management*, 13(4), 337–348. https://doi.org/10.1016/S0956-5221(97)00020-1

Phelps, C., Heidl, R., & Wadhwa, A. (2012). Knowledge, networks, and knowledge networks: A review and research agenda. *Journal of Management*, 38(4), 1115–1166. https://doi.org/10.1177/0149206311432640

Provan, K. G., & Lemaire, R. H. (2012). Core concepts and key ideas for understanding public sector organizational networks: Using research to inform scholarship and practice. *Public Administration Review*, 72(5), 638–648. https://doi.org/10.1111/j.1540-6210.2012.02595.x

Reagans, R., & McEvily, B. (2003). Network structure and knowledge transfer: The effects of Cohesion and range. *Administrative Science Quarterly*, 48(2), 240–267. https://doi.org/10.2307/3556658

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169. https://doi.org/10.1007/BF01405730

Rotmans, J., Loorbach, D., & Kemp, R. (2012). Complexity and transition management. In G. de Roo, J. Hillier, & J. van Wezemael (Eds.), *Complexity and planning: Systems, assemblages and simulations* (pp. 177–198). Routledge.

Rydin, Y. (2007). Re-examining the role of knowledge within planning theory. *Planning Theory*, *6*(1), 52–68. https://doi.org/10.1177/1473095207075161

Rydin, Y. (2013). Using actor–network theory to understand planning practice: Exploring relationships between actants in regulating low-carbon commercial development. *Planning Theory*, *12*(1), 23–45. https://doi.org/10.1177/1473095212455494

Schipper, D., & Spekkink, W. (2015). Balancing the quantitative and qualitative aspects of social network analysis to study complex social systems. *Complexity, Governance and Networks*, *2*(1), 5–22. http://dx.doi.org/10.7564/15-CGN23

Scott, J. (2017). *Social network analysis* (4th ed.). Sage.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization*. Doubleday Currency.

Siciliano, M. D. (2017). Ignoring the experts: Networks and organizational learning in the public sector. *Journal of Public Administration Research and Theory*, *27*(1), 104–119. https://doi.org/10.1093/jopart/muw052

Stead, D. (2008). Institutional aspects of integrating transport, environment and health policies. *Transport Policy*, *15*(3), 139–148. https://doi.org/10.1016/j.tranpol.2007.12.001

Stokman, F. N., & Doreian, P. (1997). Evolution of social networks: Processes and principles. In P. Doreian & F. Stokman (Eds.), *Evolution of Social Networks* (pp. 233–250). Routledge.

te Brömmelstroet, M., & Bertolini, L. (2010). Integrating land use and transport knowledge in strategy-making. *Transportation*, *37*(1), 85–104. https://doi.org/10.1007/s11116-009-9221-0

Tell. (2011). Knowledge integration and innovation: A survey of the field. In C. Berggren & A. Bergek (Eds.), *Knowledge integration and innovation: Critical challenges facing international technology-based firms* (pp. 20–38). Oxford University Press.

Tell, F., Berggren, C., & Van de Ven, A. H. (Eds.). (2017). *Managing knowledge integration across boundaries*. Oxford University Press.

Tornberg, P. (2011). *Making sense of integrated planning: Challenges to urban and transport planning processes in Sweden* [Doctoral dissertation]. KTH Royal Institute of Technology. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-48968

van de Ven, A. H. (1992). Suggestions for studying strategy process: A research note. *Strategic Management Journal*, *13*(S1), 169–188. https://doi.org/10.1002/smj.4250131013

Vigar, G. (2009). Towards an integrated spatial planning? *European Planning Studies*, *17*(11), 1571–1590. https://doi.org/10.1080/09654310903226499

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications (Vol. 8)*. Cambridge University Press.

Zhao, M., & Wang, Y. (2018). Measuring segregation between rural migrants and local residents in urban China: An integrated spatio-social network analysis of *kecun* in Guangzhou. *Environment and Planning B: Urban Analytics and City Science*, *45*(3), 417–433. https://doi.org/10.1177/2399808317710658