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Mapping the Use of Planning Support in a Strategy-Making Session

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This paper introduces an alternative means of evaluating the performance of planning support systems. These systems that were originally developed to support the professional tasks of planners have been assessed primarily based on their task-technology-user fit. During the tasks of early planning phases, planning actors attempt to adapt planning issues out of their 'wicked' state and into clear directions for action by means of communication. The search for better support of adaptations that result from these complex, multi-actor communications requires a more dynamic means of evaluating planning support. To gain a deeper understanding of planning support use during actor communications, we conducted a strategy-making session using preliminary modelling, sketching, facilitation and traditional support tools. We visualized the session as a network of communicative interactions and identified planning support involvement during key issue adaptations. Findings show that preliminary modelling and sketching were often used when identifying planning issues and adapting them into attributes for scenario development and that unsupported dialogue was used to communicate in depth about project objectives. We conclude that introducing planning support as needed in formats that are both visual and easy-to-understand may add value to strategy making in workshop settings.

Keywords: Communicative interactions, facilitation, planning support systems, preliminary modelling, sketching, social systems.

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Please cite as: Champlin, C., Hartmann, T. & Dewulf, G.P.M.R. (2018). Mapping the Use of Planning Support in a Strategy-Making Session. *plaNext – next generation planning*. 6: 5-24. DOI: 10.24306/plnxt.2018.06.001.

Introduction

The introduction of the complexity sciences to the study of cities has generated new insights into highly networked urban environments where everything seems connected to everything else (Healey, 2007; Castells, 1989). Only recently has the planning of these environments been examined rigorously from a complexity perspective (Portugali, 2012). Research on complexity in planning has been compiled in publications under the header of complexity theories of cities (CTC) in edited books and in a 2016 theme issue of Environment and Planning B (Sengupta et al., 2016; de Roo et al., 2012; Portugali et al., 2012; de Roo & Silva, 2010). Contributions within these publications describe the open, multi-actor, nonlinear processes of the communicative rationality model that currently dominates European planning, and argue for an openness to the diversity of knowledge that new actors bring to spatial planning (de Roo & Rauws, 2012). Others caution that too much structuring of these communicative planning processes may produce too simple results (Sijmons, 2012).

Planning support tools that were traditionally designed to address reasonably clear problems have not made a successful transition to these complex, multi-actor contexts (Albrechts & Balducci, 2013). This reality has opened the current discussion on the added value of planning support systems (PSS) in practice. PSS have been defined as 'geoinformation technology-based instruments that incorporate a suite of components (theories, data, information, knowledge, methods, tools…) that collectively support some specific parts of a unique professional planning task' (Geertman, 2008, p.217). PSS provide useful support during problem exploration and analysis tasks, but expert users consider them of limited added value to problem formulation tasks (Vonk, 2006). This may explain why most PSS have not found their way into the early phases of planning (te Brömmelstroet & Bertolini, 2008). Issues early on are still open and must be sorted out, making early planning phases dynamic and unpredictable (te Brömmelstroet, 2016, 2010).

The added value question has prompted PSS scholars to investigate the task-technology-user fit (Pelzer et al., 2015a; Geertman, 2013; Vonk et al., 2007; Goodhue & Thompson, 1995) to understand the necessary conditions of use of PSS in complex, collaborative contexts. Several recent studies of PSS use have been conducted in workshop settings. These studies emphasize a growing need for environments that nurture communication and shared learning rather than the continued contribution of more analytical information to practice (Champlin et al., 2018; Pelzer, 2017; te Brömmelstroet, 2016; Pelzer et al., 2015b; Pelzer et al., 2015a; Goodspeed, 2013). Such environments should support the exchange of knowledge about planning issues in a manner that gives form to problems at stake (Geertman, 2006). Communication is central to sorting out the different types of knowledge needed to define and locate problems within a complex causal network (Rittel & Webber, 1973). Tool use must be balanced in a way that supports group communication without disrupting it (Pelzer *et al.*, 2015b) allowing actors to move planning issues effectively out of the problem mess – a process we refer to in this paper as *issue adaptation*.

Determining the 'fit' of support tools may require a more dynamic means of evaluating planning support performance than what the task-technology-user fit provides. Geertman (2013) proposed a new planning support science (PSScience) research agenda for exploring how to organize planning support instruments (e.g. modelling and visualization tools) in relation to the planning actors (and their knowledge), issues and tasks in place- and time-specific contexts that constitute complex systems. This agenda links planning support research to the growing field of CTC research, and in doing so, it provides a framework for the study described in this paper. We attempt to move 'beyond metaphor' in the application of complexity thinking (Sengupta *et al.*, 2016, p.970) to examine the fit between planning support tools and planning issues in a strategy-making session.

We pose the following research question: Which planning support tools are in use when adaptations of planning issues occur? This question explores how actors organize the use of various planning support options at their disposal and for what purpose. Concepts from social systems and complex adaptive systems (CAS) theories are employed here to identify the paths of issue adaptation within a communication network. We also consider how to align planning support development with the context-specific knowledge of planning actors. It is thought that exposing developers to this knowledge during the development process improves the substantive quality of the support (te Brömmelstroet & Schrijnen, 2010).

This paper continues in the next section with an introduction to systems theory which underpins this study followed by a discussion of planning support tools that may be well-suited to support planning at an early stage. After introducing the case study, we describe the strategy-making session and method for analyzing the data that was collected during the session. We then report and discuss the empirical findings. Finally, we conclude the paper with a discussion and reflections on both the potential and limitations of the analysis method as it relates to the advancement of professionally supported collaborative planning sessions.

Systems Theory

In their seminal paper, Rittel and Webber (1973) attributed 'wicked' problems to networks of interconnected systems that make problem centers less apparent. For them, interconnectedness was the source of ill-defined planning problems that cannot be solved, but at best only re-solved. Planning actors attempt to resolve their problems by linking issues to actions and their consequences in a future-oriented 'what if…' examination of possible interventions in a spatial system (de Roo & Rauws, 2012). This process can also be couched in terms of the strategy-making tasks of problem formulation and scenario development (te Brömmelstroet & Bertolini, 2008; Couclelis, 2005). During strategy making, issues must evolve out of their wicked state and become clear directions for action. According to van de Riet (2003), this involves linking the current situation to possible futures and defining evaluation criteria and constraints for making a selection. Through extensive communicative interactions (Luhmann, 1990), planning actors send and receive information as they set a framework for choice making. While planning literature offers ample explanations of *why* actors in a planning system must make choices, social systems and CAS theories shed light on *how* these choices are made.

Choice making determines the well-being of a system and its ability to adapt. A planning system must 'learn' through its communication interactions and adapt its discourse. To trigger these adaptations, planning actors require efficient means of communicating their many planning issues without being left with too few from which to select. Issue selection is, therefore, a balancing act since 'systems that are too simple are static and those that are too active are chaotic' (Miller & Page, 2007, p.129). One mechanism a system uses to strike this delicate balance is *contingency* (Luhmann, 1995). Contingency preserves the complexity of a system by making choices that momentarily reduce complexity. It recognizes the possibility of an alternate path, had other choices been made (Holland, 1995). To determine these paths, different types of knowledge (see Albrechts & Balducci, 2013) are required along with effective means for choice making. Dennis and Wixom (2002) describe how actors reach agreement on the best alternative(s), first by generating a wide variety of options (divergence) and then selecting from these options (convergence). Divergence can be encouraged in a way that reveals actor issues and preferences, or what Harris (1989) calls 'hidden or undeveloped criteria of choice' (p.88). Convergence can then be facilitated to reach agreement on key objectives. When these dynamics of divergence and convergence are executed effectively, contingency can give quality to pure quantity (Luhmann, 1990).

When faced with an elaborate set of choices, actors may adopt mechanisms that structure the choice making process (Miller & Page, 2007). Planning support tools can serve this purpose. These tools demonstrate agency, or the ability to 'manipulate, at least partially, their outputs so as to influence the actions of others' (Miller & Page, 2007, p.95). Couclelis (2005) relates this to the way actors use models to feed information into decisions that influence a spatial system. Planning support tools may, however, have undesirable disruptive impacts on system adaptation. Means of planning support may be unsuited to the task (Webster, 2010) or their outputs may produce too much order, which is at odds with the unpredictable and uncertain nature of planning (Sijmons, 2012).

By now, we know well that planning processes do not neatly follow a 'sequence of well-defined steps' (Bishop, 1998, p.189). Planning support must be designed in a way that provides structure while permitting nonlinearity. There is some indication that nonlinear adaptation can be triggered at discrete moments. According to CAS literature, systems exhibit lever points, i.e. 'points where a simple intervention causes a lasting, directed effect' (Holland, 2006, p.6). Still, scholars know little about how to utilize lever points. Samoilenko (2008) explains, one would require a methodology to search for the lever points, the capability to affect them and upfront knowledge about the impacts the lever points may have. These issues are significant and require research that extends beyond the scope of this paper. But we can already begin to scratch the surface through experimentation and observation that are guided by existing theory.

In his earlier work on lever points, Holland (1995) explained that all CAS have two adaptation properties in common that are well-known in economics, the multiplier effect and the recycling effect. The *multiplier effect* occurs when a resource passes from node to node catalyzing a chain of adaptations and is potentially transformed in the process. Mazhelis *et al*. (2006) explains, 'the cumulative effect of an initial change (interaction) is increased (multiplied) as the change is propagating through the network' (p.7). Applied to strategy making, we can imagine an issue being triggered to 'firework' into multiple measurable or location-specific attributes that can be used in scenario development.

The *recycling effect* uses the same raw input that, cycle after cycle, is captured and reused at each node of a path (Holland, 1995). As strategy making evolves from a discussion over wicked problems to clear directions for action in the spatial system, recycled planning issues can be traced back to (nearly) every communicative interaction in the adaptation path. The recycling effect may indicate the efficiency of the system in capturing and reusing issues during adaptation. Efficiency has been used as an indicator in PSS and decision support systems (DSS) studies to measure the influence of information technology on group or organizational performance in decision making (see Yamu, 2014; Shim et al., 2002).

Early-stage Planning Support

We define planning support as 'all the professional help in the form of dedicated information, knowledge and instruments that intentionally improve planning processes…and or planning outcomes' (Geertman, 2013, p.51). This definition originates from PSS literature, but it acknowledges that PSS are one of many planning support tools. It can generally be said that these systems are developed with a specific professional task in mind (Pelzer et al., 2015a; te Brömmelstroet, 2012; Geertman & Stillwell, 2004; Goodhue & Thompson, 1995) and therefore, are not well-suited for other tasks. In this section, we review tools that are known to support group work and, therefore, may support communication during strategy making in a more dynamic manner. By dynamic, we mean the reciprocal adjustments that users, tasks and supporting tools must make to be responsive to a specific context of time and place

(Geertman, 2013). We explore the potential contribution of these tools to the strategy-making tasks of problem formulation, objective setting and scenario development.

Preliminary modelling

Dialogue between developer and intended user is the cornerstone of group modelling approaches (e.g. system dynamics modelling, mediated modelling) and is now becoming an integral part of PSS development (te Brömmelstroet & Schrijnen, 2010; Voinov & Bousquet, 2010). According to te Brömmelstroet and Schrijnen (2010), 'the focus shifts away from the development of a technically more sophisticated support system, towards a process of PSS development that is intertwined with the planning process itself' (p.3). Modelling provides a structured process for working out the most important issues of a problem (van den Belt, 2004). It can be used to determine what factors or variables to include or exclude from the system boundary by stimulating the divergent thinking that is necessary during problem formulation or model conceptualization (Vennix, 1992).

A preliminary model can be developed prior to the beginning of a workshop based on input from interviews (van den Belt, 2004). Since the model is in an early state, end users can recognize and critique assumptions relatively easily. Critiquing and redesigning flawed parts of the model can lead to group ownership and creativity (Vennix, 1992). Preliminary modelling entails more than working out relationships of abstract concepts. Ford and Sterman (1997) hypothesized that 'pushing experts to describe relationships at the simulation model level helps them to clarify and specify their knowledge more than they would if we worked at a more abstract level' (p.313).

Traditional tools

While a continued openness to new PSS technologies is desirable (te Brömmelstroet *et al*., 2014), there are limitations to their capacity to support planning in the strategic phases. At a time when computers were new to the collaborative planning arena, Shiffer (1992) observed that participants would often opt to use more passive media like flipcharts in meetings. Integrating such traditional tools with new technologies may create the social learning environment that enables productive interaction (Al-Kodmany, 2001). Sketching is a tool that invites participants into the design process by using visualization as a common language and in doing so, promotes dialogue and provides accurate design information for later applications (Al-Kodmany, 2001; King *et al.*, 1989). Sketching on a map can be used to rapidly work out spatial relationships between elements without knowing their geographic positions (Hopkins, 1999). It is a visualization method whose strength lies less in the accuracy of information it conveys than in its capacity to stimulate communication.

Facilitation

Janssen *et al.* (2006) state that the more uncertainties involved in the task, the more dialogue should be facilitated. Facilitation involves dynamic interventions to manage relationships between actors, tasks and tools, to structure tasks and to contribute to achieving meeting outcomes (Hayne, 1999). Hirokawa and Gouran (1989) explain that facilitation should address both procedural and substantive problems. This is necessary since process and outcome are often blurred (Innes & Booher, 1999). *Procedural* facilitation deals with agenda setting, time keeping and ensuring that discussion remains relevant. *Substantive* facilitation manages the use of available information for making group choices. Noting that tool use often interrupts communication, Pelzer *et al*. (2015b) added *tool-related* facilitation to this list. They concluded that facilitation performs an important function in PSS workshops to encourage tool use while also providing sufficient space for group discussion.

Dialogue itself is considered a means of planning support. The Habermasian notion of reflexive dialogue refers to the collective interpretation of the world and agreement in a specific context using the richest available resources to test assumptions (Healey, 1999). If well-managed, dialogue can produce high-quality agreements, flexibility, learning and change (Connick & Innes, 2003), all of which are needed – though difficult to attain – in complex, multi-actor contexts. On this basis, we suggest that the aim of planning support, particularly during strategy making, is not to support a specific planning task or user need, but rather to support dialogue in its handling of planning issues. We hypothesize that by untethering the components of the task-technology-user fit, we will see patterns of planning support use that do not fit neatly within a specific planning task or correspond to an individual user need.

Case Description and Methodology

The purpose of the empirical study was to examine the issues planning actors discuss in a strategy-making session when using different types of planning support. In this section, we describe the case study, the strategy-making session and the analysis method.

The Turfkade case

The 134-hectare Turfkade business terrain sits in Almelo, a city in the eastern part of the Netherlands, roughly 30 km from the German border. The terrain primarily consists of mid-sized industry and producers, some of which own their own buildings while others rent. The terrain, which dates back to the 1800s, received its last significant modernization in the 1970s. Currently, the combined impact of industrial sector decline and proliferation of younger commercial terrains in the region has pressured the local government to invest in revitalization. The Province of Overijssel initiated the Turfkade project by providing support and financing through *Herstructureringsmaatschappij Overijssel* (HMO), a company established to stimulate investment in the industrial terrains, business parks and inner cities of Overijssel.

To gain a better grasp of the planning problem, we visited the business terrain three times, interviewed the account manager, a city planner, the director of HMO, and a Province official who were involved in the project, reviewed project documents and conducted a project maturity assessment with the account manager. The results of the maturity assessment primarily indicated that: stakeholders were not involved in the revitalization project and were unaware of the potential impacts of the project. Furthermore, the planners were interested in utilizing planning support tools but so far, no support technologies or visualization techniques had been used. Based on the assessment results, we suggested to conduct a strategy-making session with the account manager and some representatives of the business owners. During the session, we would collaboratively develop a model that the account manager could use to communicate project plans and receive feedback from a larger group of business owners.

The strategy-making session

We use the PSScience research agenda (Geertman, 2013) as a framework for describing the Turfkade strategy-making session as a system that consists of planning actors, issues, tasks and their relations in a given context of time and place (see Table 1):

- The *planning actors* included the account manager, a business owner[1] (referred to as the Turfkade actors), a session facilitator (first author) and a chauffeur (second author) who facilitated interaction with the model. Following the action research method Baskerville (1999), the authors performed a role similar to organizational consultants.

[1] A second business owner was scheduled to participate but cancelled on the day of the session.

According to this method, researchers intervene in the problem setting and engage in participatory observation.
- We derived the three *planning tasks* from studies of strategy making (te Brömmelstroet & Bertolini, 2008; Couclelis, 2005), non-routine planning tasks (Batty, 1995) and policy making in multi-actor contexts (van de Riet, 2003): problem formulation, objective setting and scenario development.
- The *planning issues* were the products of the three strategy-making tasks. Throughout the strategy-making tasks, issues originating from the planning problem adapted into project objectives, attributes of the planning issues, scenarios and indicators for assessing the scenarios.
- The *planning support instruments* included tools known to support multi-actor communication (see Early-stage Planning Support): preliminary modelling, sketching, flashcards and procedural, substantive and tool-related facilitation.
- We conceptualized the *factual role of planning support* as planning support involvement in the successful adaptation of a planning issue during one or more communication interactions.
- The context of planning support was the Turfkade strategy-making session

Prior to the session, the second author programmed a preliminary model of the Turfkade terrain on a Google Maps base layer using JavaScript, which the first author then used to create a buildings layer. This layer consisted of building quality ratings that the account manager sketched on a paper map of the project area. The building quality ratings ranged from one (old or poor condition) to five (new or good condition). The preliminary model included an area deterioration indicator that was generated using the building quality ratings and a building proximity measurement. The proximity measurement factored the quality ratings of neighboring buildings into the quality rating of a given building to indicate the perceived quality of the area.

Table 1 Adapted version of the PSScience research agenda (Geertman, 2013, p. 53) to describe the components of the Turfkade session.

	Substantive categories	Turfkade session
Elements	▪ Actors involved	▪ Account manager, business owner, facilitator, chauffeur
	▪ Planning issues (in categories)	▪ Planning problem, issues, objectives, attributes, indicators, scenarios
	▪ Planning tasks	▪ Problem formulation, objective setting, scenario development
	▪ Planning support instruments	▪ Preliminary modeling, sketching, flashcards, facilitation (including procedural, substantive, tool-related)
Relations	▪ Factual role of planning support	▪ Successful adaptation of planning issues
Context	▪ Place- and time-specific environments of planning support	▪ Turfkade strategy-making session

The strategy-making session was not scripted. Instead, the first and second authors planned a sequence of planning tasks: problem formulation (issue divergence), objective setting (issue convergence) and scenario development (attribute divergence). They also decided in advance when to introduce the different planning support tools. The second author opened the session by introducing the preliminary model. The Turfkade actors worked with the area deterioration indicator as an ice breaker for the problem formulation task. Next, flashcards were introduced for objective setting. The Turfkade actors were each asked to choose flashcards corresponding to their four most important issues (collected during the four interviews). If their main issues were not on the card, they could write in new issues on blank flashcards. The Turfkade actors were instructed to use these main issues as a basis for setting three objectives. Due to time restrictions, the Turfkade actors were asked to select the two most important objectives to work with for scenario development. Finally, they were instructed to sketch possible solutions that met the two objectives as descriptively and creatively as possible. The authors determined when to provide substantive, procedural and tool-related facilitation as needed.

Analysis of the session

To conduct the analysis, we developed a network that depicts the communicative interactions that occurred during the strategy-making session. These interactions are organized into a network of nodes linked together by edges. The nodes represent issues of the Turfkade project and their adaptation into objectives, attributes, indicators and scenarios, each originating from the project problem: ‘degradation of the terrain’. In addition to linking the issues and their derivatives, the edges provide directional information (what did an issue become?) and identifying information (what type of planning support was involved?) about the adaptation of an issue. Directional information is important to record because the way people communicate does not follow the linear progression of steps (Engeström, 2011). We define adaptation as the transformation of an issue into something characteristically different than its previous state. When issues can be classified in a new category or are clarified using more specific or descriptive detail, they qualify as issue adaptations.

We captured the communicative interactions among the planning actors using written records on session materials, audio-visual recordings and photography. We began the analysis with an open coding (Strauss & Corbin, 1990) of the session transcript, first by hand and then using ATLAS.ti 7 software. During open coding, we marked each instance in the transcript where an issue was communicated and color-coded them by issue category. Next, we transferred these instances in chronological order to an Excel spreadsheet and categorized them based on strategy-making task. Once each instance was registered, we interpreted the links between the instances. If the same issue was communicated multiple times without adapting, we identified it as a *recurrence* and labeled it with an asterisk. We then visualized this chronological list of issues and the communicative interactions (edges) that link them in network form using Microsoft Visio 10.

Next, we returned to the audio-visual recordings to cross-check the type of planning support that was being used during each adaptation and labeled the edges correspondingly. If no planning support tool was in use during the adaptation, we labeled the edge ‘dialogue’. In the next section, we demonstrate the use of the network by describing four adaptation paths before introducing the entire network.

Findings

Path 1. Contingency

Figure 1 illustrates contingency in the network of communicative interactions. Divergent communicative interactions about the planning problem ‘degradation’ produced 31 issues.

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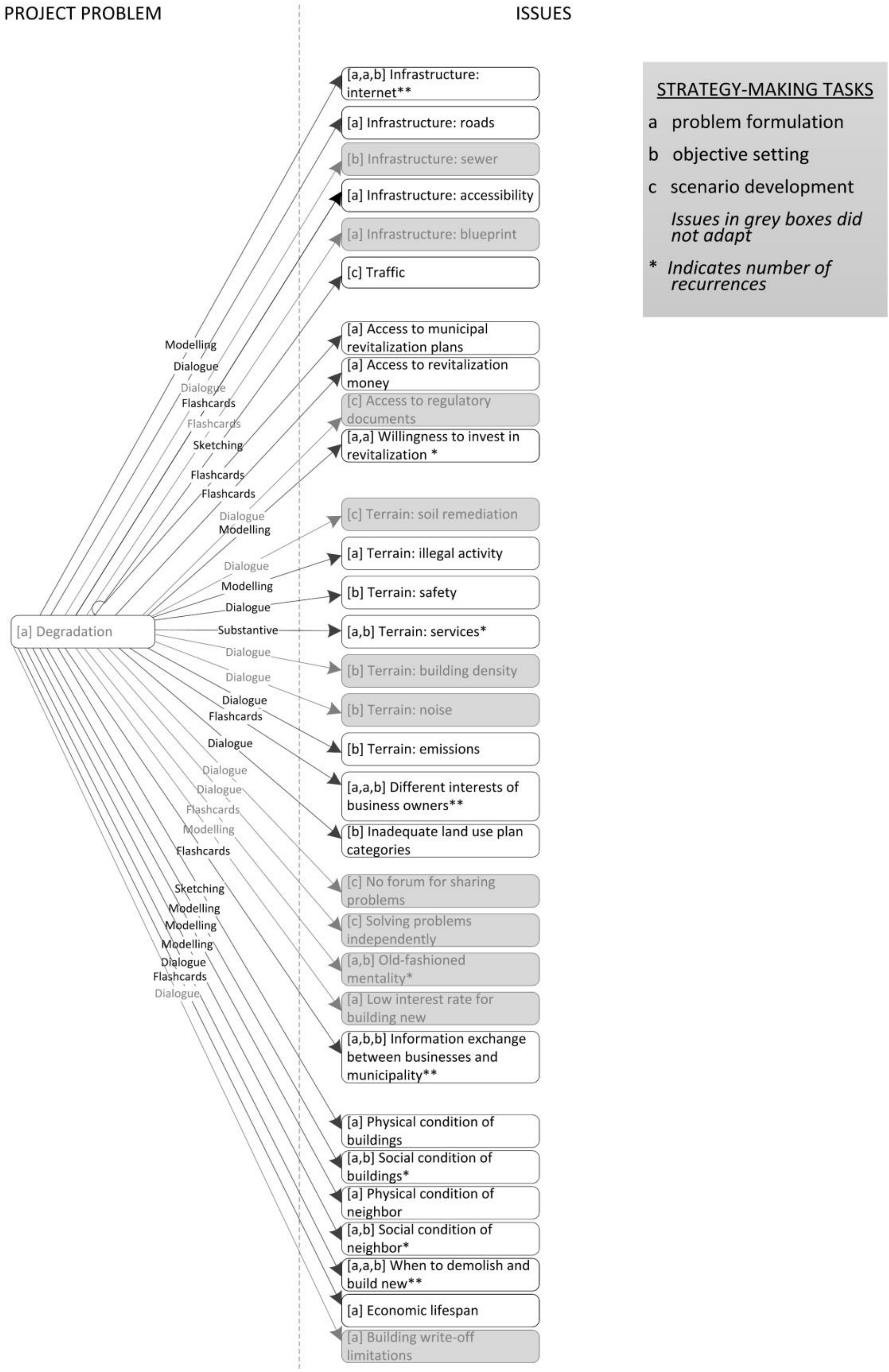

Figure 1. Contingency path with issues that did not adapt marked in grey. Source: Author.

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Convergent communicative interactions resulted in the selection of 20 issues for adaptation, while 11 issues (grey boxes) were not selected. Of the planning support options, preliminary modelling and flashcards were both associated with the most issue adaptations. Each of these options was used in the selection of six (6) issues followed by dialogue (5), sketching (2) and substantive facilitation (1). Procedural and tool-related facilitation were not observed in any of the adaptations. Dialogue (8) was most often associated with issues that were not selected, followed by flashcards (2) and preliminary modelling (1). This means we found the involvement of one of the planning support options in three-quarters (0,75) of the issue selections, while we associated dialogue with the majority (0,73) of the issues that were not selected. The contingency path also shows that of the five issues that appeared in the communication network during scenario development (c), only one of these issues 'traffic' underwent adaptation.

Path 2. Multiplier effect

The second path (Figure 2) illustrates the multiplier effect, where adaptations to the issues 'infrastructure: internet', 'infrastructure: roads' and 'traffic' occurred. During problem divergence, these issues were selected with the use of preliminary modelling, dialogue and sketching, respectively. Adapting these issues into attributes involved the use of sketching only, except for the issue 'traffic' during which procedural facilitation was also in use.

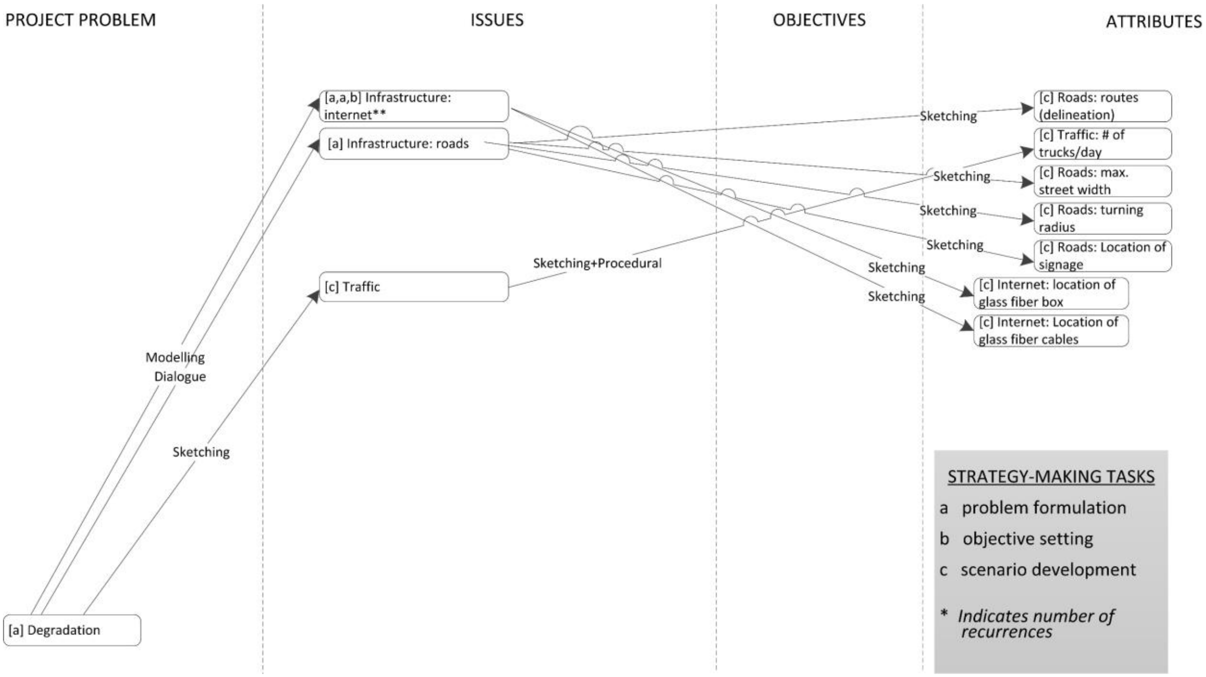

Figure. 2 Multiplier effect showing issues that adapted into several attributes using sketching and procedural facilitation. Source: Author.

While sketching, the Turfkade actors had difficulty identifying attributes for scenario development. Therefore, the facilitator and chauffeur explained the type of information they required:

> Facilitator: *We need to know what we should create in a virtual environment to help you discuss with the other stakeholders using these [the model].*
>
> Chauffeur: *If we know what the needs are for each building…then we can say, good,*

> *but at this moment there is an owner who needs internet and because of that the area does not work well. We can calculate this. So, he moves out and someone else moves in to that …with a need for traffic and the traffic is organized well there. Then you can look at how it works.*
>
> Business owner: *Measurement of the delivery intensity, how easily can I access the main road? …and that clients [of one business] can exit easily without being blocked by freight trucks that make deliveries twice a day randomly to the neighbor.*

Subsequently, sketching was used while the Turfkade actors identified four attributes of the 'roads' issue ('road width', 'route delineation', 'turning radius of trucks' and 'location of signage') and one attribute of the 'traffic' issue ('number of trucks per day'). They sketched two attributes of the 'Internet' issue ('location of fiber optic cables' and 'location of a new fiber optics box').

Path 3: Recycling effect

In the third path (Figure 3), flashcards and dialogue were used when the issues 'when to demolish and build new' and 'economic lifespan of a building' were selected. Using only dialogue, both of these issues were recycled into the scenario assessment indicator 'building age greater than 25 years'. Subsequently, the facilitator and chauffeur supported the Turfkade actors substantively to create a scenario 'remove all buildings with expired economic lifespan'. The path that resulted in this scenario indicates a link between dialogue and recurrence. The Turfkade actors repeatedly communicated about the issue 'when to demolish a building' throughout the session, first during issue divergence:

> Business owner: *I would wipe a third of the buildings off the map…but they provide ambiance. When do you part ways with the old [buildings]?*

Then during issue convergence using dialogue (recurrence 1):

> Account manager: *when do you say farewell to a building, when its economic lifespan is over?*

And again, during objective setting using dialogue (recurrence 2):

> Account manager: *If you take it [old multi-business facility] out, you revitalize. You give it a new function. It could be that you get a piece of land back where you can do what you want if you arrange it. Then you are a step further.*

Adapting into the indicator 'building age less than 25 years' using dialogue:

> Account manager: *There should be a rule, after 25 years, knock it down. Then you don't hold on to anything and you have plenty of space.*

Subsequently, the indicator 'building age less than 25 years' adapted into a scenario using substantive facilitation:

> Chauffeur: *I have no problem if we develop a plan…where half of the terrain must go…And we conclude that we must demolish a portion and then that portion can continue on a smaller scale.*
> Account manager: *That's what needs to happen here.*

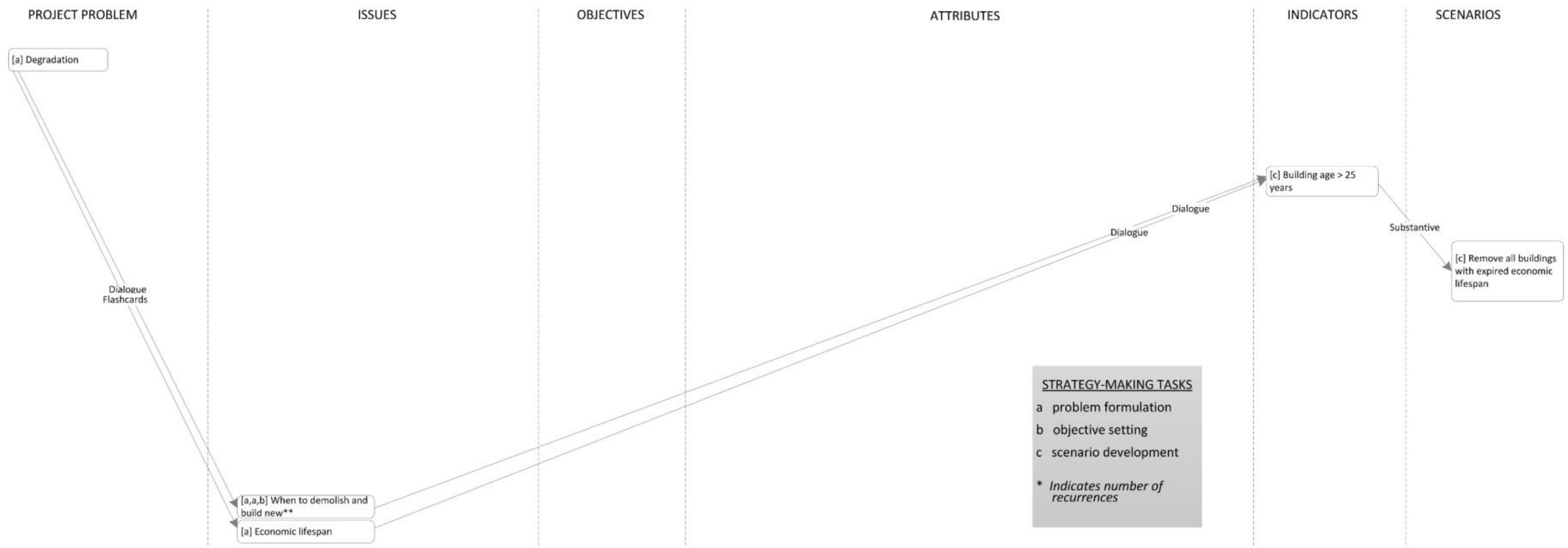

Figure. 3 Recycling effect showing the adaptation of issues from project problem to scenario. Source: Author.

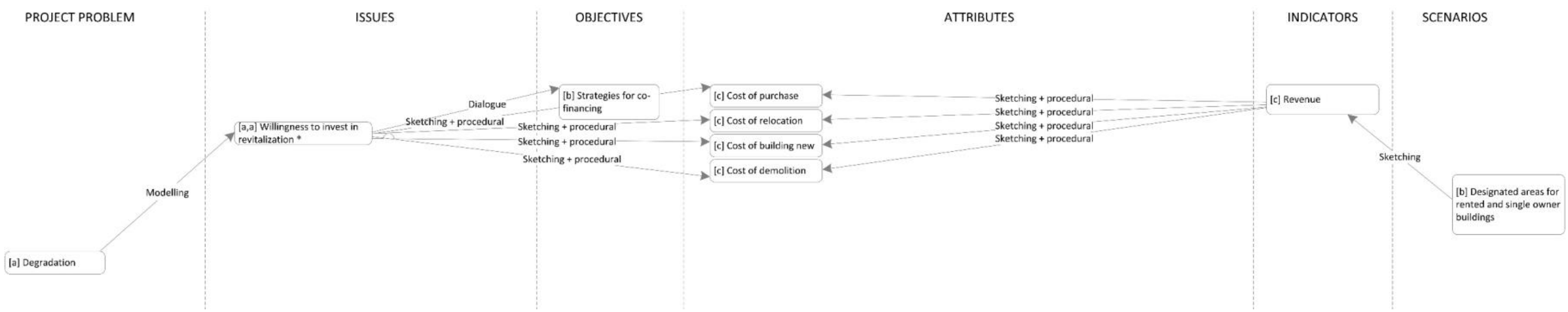

Figure. 4 Combined multiplier and recycling effects shown in a single path view. Source: Author.

Path 4: Combined multiplier and recycling effects

Another path (Figure 4) demonstrates how a combination of the multiplier effect and the recycling effect integrates issues, an objective, attributes, an indicator and a scenario into a single path. First, preliminary modelling triggered a discussion about the issue 'willingness to invest in revitalization'. Subsequently, the Turfkade actors used dialogue to adapt this investment issue into the objective 'strategies for co-financing'.

During objective setting, the actors adapted the scenario 'designated areas for rented and single owner buildings' into the indicator 'revenue'. Then during scenario development, the abovementioned issue and indicator were adapted into a set of attributes using both sketching and procedural facilitation:

> Account manager: *What is an attribute here?*
>
> Chauffeur: *That is the where and how much.*
>
> Account manager: *Yes, the attribute is money…'1' is cost to buy, '2' is cost to relocate…and '3' is cost to build new.*
>
> Business owner: *In use. Demolish.* [pointing to different buildings on the map]
>
> Account manager: *Cost to demolish.*

The mapping of the communication network shows that these attributes were generated nonlinearly. The scenario was created during the objective setting task prior to generating attributes which occurred in scenario development. It is also worth mentioning that preliminary modelling and sketching (two support tools that are strong in communicating knowledge visually) were in use during the adaptation of the non-spatial issue 'willingness to invest in revitalization' into several non-spatial attributes pertaining to costs and the indicator 'revenue'.

Map of all adaptations during the session

Looking across the complete network of communicative interactions (**Figure 5**), three trends emerge. First, almost every recurrence in the communication network occurred in the contingency path and all but one of these recurrences involved the use of planning support. For example, during a discussion about the '*physical* condition of a building' and '*physical* condition of neighboring buildings', sketching and the preliminary modelling apparently triggered recurrences of two non-spatial issues '*social* condition of building' and '*social* condition of neighboring buildings'. This discussion led to a significant shift in focus for the entire session. An excerpt from this discussion illustrates the shift:

> Account manager: *A building can bring down the quality of its surroundings. And the physical [condition] is significant, but the social [condition] is also significant.*

During objective setting one actor repeated the issue again stating:

> Account manager: *What kind of crowd does [building] attract and how much responsibility, but with the multi-business facility there is no accountability because everyone is a renter.*

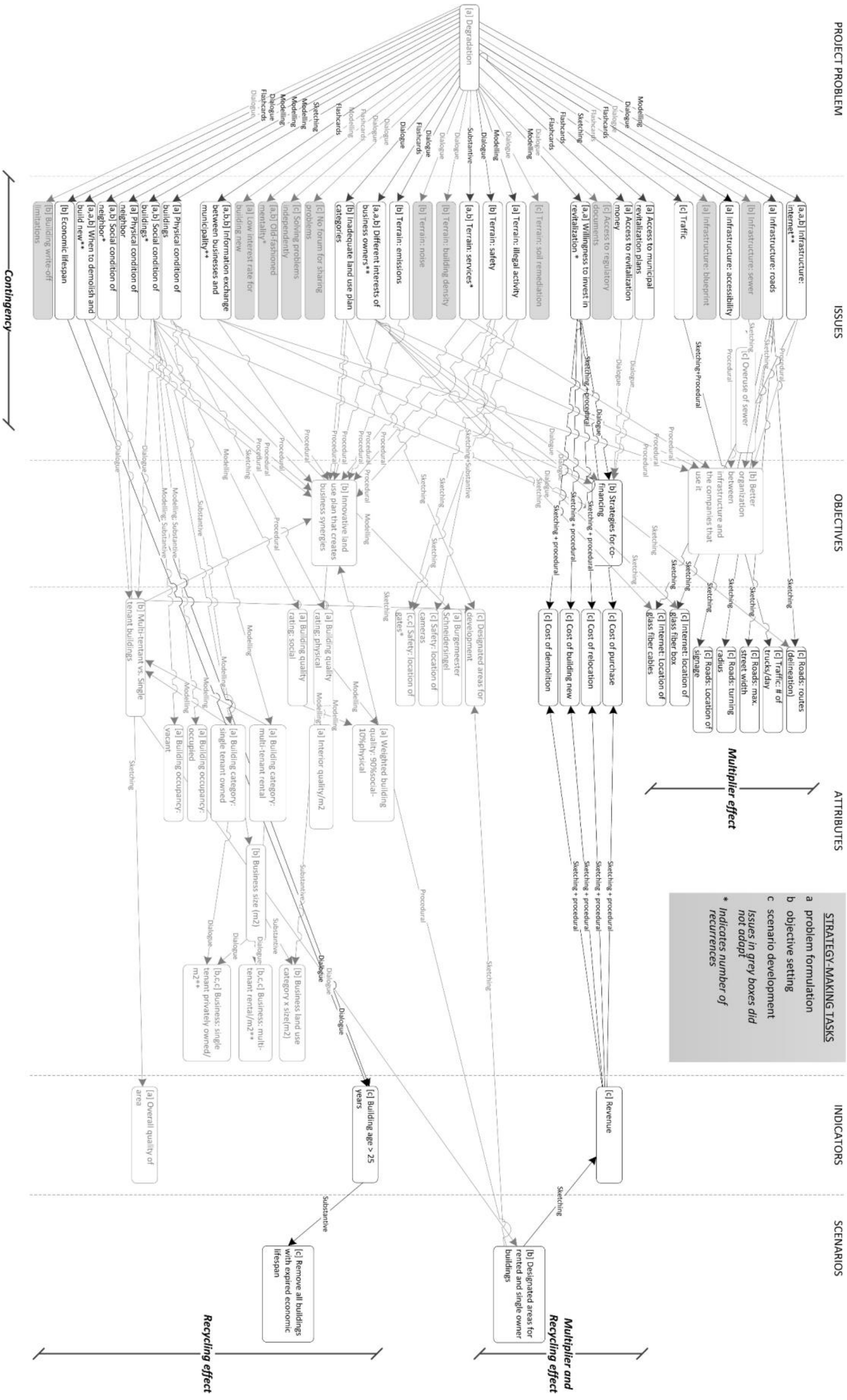

Figure. 5 Network of communicative interactions with the four paths highlighted Discussion. Source: Author.

This discussion over the social and physical condition of buildings also demonstrated nonlinearity. Soon after their introduction into the conversation (while using preliminary modelling), the Turfkade actors expressed these issues as measurable attributes (e.g. 'building category: multi-tenant rental', 'building occupancy: vacant'). During objective setting, the discussion reverted to abstracter terms, comparing one building type to another, i.e. attribute: 'multi-tenant vs. single-tenant buildings'. Subsequently, this attribute was linked to the objective 'innovative land use plan that creates business synergies', the indicator 'overall quality of the area' and the scenario 'designated areas for rented and single owner buildings'. Modelling, sketching, procedural facilitation and dialogue were all involved in the recycling of this attribute.

Second, a large number of issues were involved in objective setting and were linked to one or more of the three objectives. Other than the use of procedural facilitation to help structure the objective-setting task, the actors did not use any planning support tools. Instead, they relied on unsupported dialogue.

Third, we observed that when actors communicated about the issue 'multi-tenant versus single-tenant buildings' (while using preliminary modelling), they also created the scenario 'designated areas for rented- and single-owner buildings'. This occurred early in the workshop during the objective-setting task. Subsequently, the Turfkade actors sketched attributes and generated an indicator for assessing the scenario. This trend shows an efficient path of issue recycling that was triggered by the use of preliminary modelling.

Discussion

PSS performance so far has been evaluated largely based on the task-technology-user fit of these systems. Given the 'communicative turn' (Healey, 1996) in planning, reciprocal adjustments (Geertman, 2013) must be made between tasks, tools, users and their knowledge to support communication in complex, multi-actor settings. Complexity thinking contributes a new perspective that is focused on the dynamics of communication between actors and across multiple planning tasks. In this study, we have dissected multi-actor communications and examined them at the communicative interactions level to better understand the use of planning support in a strategy-making session. We explored the question: Which planning support tools are in use when adaptations of planning issues occur? We were able to identify several characteristic adaptation paths and the presence of planning support at key moments during these adaptations.

Findings from the contingency path show that issues communicated through unsupported dialogue in most cases were not selected for adaptation. This means the issues were communicated once, but as the session progressed, the actors did not refer to them again. It is possible that unsupported dialogue lacked the structure necessary to focus communication on the most important issues surrounding the area degradation problem. Difficulty gaining clarity about planning issues is a common challenge in planning and it contributes to the well-known 'fuzzy' problems that characterize the early phases of planning. A need for structure might also help to explain why most of the issues that did adapt were identified using planning support of various types. However, once key issues had been identified (issue divergence), the actors seemed to rely heavily on dialogue to gain agreement on their project objectives (issue convergence). This could be seen in the many recurrences of issues linked to the project objectives, indicating that these issues were discussed several times. Here, it seems that actors used dialogue to work out their different understandings and knowledge about a planning issue.

Findings from the multiplier effect path show that some issues were adapted early into model attributes. Although the actors mostly used preliminary modelling or sketching to generate these attributes, more traditional tools were also used to generate the issues from which the attributes emerged. It is conceivable that the use of visualization techniques, particularly the preliminary model, oriented communication towards issues that are more suitable for spatial modelling, perhaps to the detriment of critical non-spatial issues. Geertman (2006) explains we should be aware that some issues lend themselves better to quantitative analytical or modelling support than other issues. On the other hand, working with visual, map-based support methods may provide an effective means to identify important issues, both spatial and non-spatial, and to communicate about them concretely. A good example of this occurred while working with the preliminary model. The actors decided that the physical condition of buildings was not the only factor causing area degradation. Undesirable activities in and around some buildings were also a critical factor. While sketching, the actors diverged to identify multiple interrelated attributes and indicators. In some instances, procedural facilitation was necessary to formulate the indicators. It seemed that the Turfkade actors were not accustomed to communicating about their issues in quantifiable or measurable terms.

In the recycling effect path, we observed efficiency in the communication interactions. Through the combined use of dialogue, flashcards and substantive facilitation, the actors managed to develop a basic but complete scenario. This efficiency finding may indicate that a balance between support tool use and group communication (Pelzer et al., 2015b) was achieved. The combined multiplier and recycling effects path shows that issue adaptations can be even more efficient when both are triggered. The communicative interactions in this path adapted in a nonlinear, non-sequential way. The combination of structure and different visualization methods apparently enabled the actors to move both efficiently and nonlinearly through the strategic tasks of problem formulation and scenario development. Looking at the entire strategy-making session in a single network view, it seems that issues that could be easily clarified and related to the spatial system were quickly adapted using visual, yet easy-to-understand support (i.e. preliminary modelling and sketching) while the less clear, more conceptual issues required unsupported dialogue, and at times facilitation, to adapt. These findings indicate the need for applications of planning support methods in multiple formats to support efficient communication during strategy making.

Together, these findings suggest that factors of structure, visualization and simplicity implemented on an as needed basis may be significant to consider when developing planning support. Since actors may be easily overwhelmed by sophisticated models, softer introductions to the technology like working with preliminary models may prove beneficial. We know from literature that these softer visual methods support divergent thinking, which is needed both for problem formulation and for the production of accurate design information (Al-Kodmany, 2001; King *et al.*, 1989). Furthermore, the active participation of the facilitator and chauffeur in the strategy-making session provided these project 'outsiders' contextual information that may be useful for the further development of models and other planning support.

While the design of this study does not permit us to draw conclusions about causality between planning support tool use and communication, the findings do offer an example of how planning support performance can be viewed from a dynamic, issue-oriented perspective. From this perspective, planning support can be evaluated based on its capacity to stimulate adaptations at the communicative interactions level – potentially contributing to progress in a collaborative planning context.

Reflections

In this study we were interested mainly in the mechanics of how issues adapt during dialogue and also when planning support is used. Further research that engages planning and policy-making theory may provide explanatory power to the observations we have reported. The method we developed to investigate planning support use at the communicative interactions level could be reproduced in sessions with more participants. For large multi-actor group settings, the manual mapping methodology presented in this paper may become too tedious. Online software packages such as Gephi (https://gephi.org/) and NetworkX (http://networkx.github.io/) generate sophisticated network analyses and visualization that may better support the interpretation and communication of large data sets. It would also be interesting to use such software to compare networks of communicative interactions across multiple strategy-making sessions or projects. Such a comparison could help to build theory about causal relationships between planning support and issue adaptations. Nonetheless, it is not too soon to begin experimenting with the principles of structure, visualization and simplicity and incorporating them into games, methods and techniques to provide flexible, customized support to actors during the early phases of planning projects.

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