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Real-time foresight : preparedness for dynamic innovation networks

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2 From traditional management to dynamic collaboration

The aim of this chapter is to better understand the conceptual problems of collaborative management in real-time by way of a focused literature review. From this investigation, it will be possible to identify those strategic management traditions and conceptual key elements that counteract successful dynamic innovation processes. The goal here is to answer RQ 1: why do strategic management and foresight fail in ad hoc collaboration?

Managing ad hoc collaboration with multiple independent actors causes problems even for highly professional actors. In the following, we retrace traditions of management theory and foresight to better understand why this is the case. Then we focus on conglomerations of classic management and collaboration approaches, namely in collective action theory and network studies. In recent literature on innovation processes (cf. Manzini, 2014) and global relief (cf. Lalonde, 2011) innovation networks are recognised as successful methods of coping with uncertainty. Although an increasing number of scholars attribute to networks a facilitating role in collaborative governance, the mismatch with managerial concepts still persists. According to the reviewed literature, collaboration to build dynamic innovation networks (DINs) is somewhat puzzling to management and there are no concepts which might lead to a leadership turnaround. This observation provides the research rationale for a process study on alternative dynamic management structures - network patterns.

The chapter is structured as follows. Section 2.1 reviews traditions of strategic management and foresight literature. Section 2.2 investigates

collective action and network studies. In section 2.3, the chapter reviews central opposites in an interim conclusion to consolidate the elements in theory traditions that inhibit ad hoc collaboration. Section 2.4 screens recent literature on innovation networks and considers the use case of disaster management. Global relief showcases existing management problems of ad hoc collaboration and real-time foresight: collaborative recovery has innovative impact but also planning limits (cf. Ordóñez, Schweitzer, Galinsky, & Bazerman, 2009; Sachs, 2012). In this challenging management perspective, the ambivalent legacy of theory traditions is confirmed. In section 2.5, therefore, the need for a turnaround of managerial practice in dynamic innovation processes is depicted as a conceptual mismatch and empirical need. The end of the chapter builds the research rationale for a real-time foresight study.

2.1 Traditions in strategic management and foresight

Planning and foresight belong to the academic field of strategic management. In this section, the study sheds light on traditions of strategic management (2.1.1) and foresight approaches (2.1.2). Technological foresight (TF) is a process for planning into open futures. Subsection 2.1.3 ends the section by contrasting strategic planning with real-time readiness.

2.1.1 *Strategic management tradition*

Strategic management traditions can be retraced from military philosophy (see, e.g., Machiavelli, Codevilla, Allen, Arkes, & Lord, 1997) to recent microeconomics and organisation theory (cf. Hill, Jones, &

Schilling, 2014). The managerial role in strategic management is to calculate goals and risks for a company (cf. Ansoff, 1991; Eisenhardt & Zbaracki, 1992; Martinet, 2010), to target goals, and to allocate and control available resources. Individual interest is at its core; it was first formulated for powerful individual *persons*, and then became a *national*, and finally a *corporate* interest (cf. Hodgson, 2007). From its origins to the present day, planning, goal achievement and resource allocation are three basic operations of strategic management.

Some twenty years ago, strategic management absorbed a strong heritage of economic theory in its mainstream. Four issues were instrumental to this heritage in mainstream theory. First, the transaction cost approach (cf. Williamson, 1979; Ghoshal & Moran, 1996) was linked up with market and organisation theory. Second, the resource-based view (cf. Barney, 2001; Priem & Butler, 2001) contributed to showing how tangible *and* intangible resources are competitive strategic assets. Third, with the dynamic capabilities approach (cf. Teece, Pisano, & Shuen, 1997; Eisenhardt & Martin, 2000; Barreto, 2010) flexible assets for fast changing markets were introduced. Fourth, institutional capabilities were recognised as an advantage over market competitors (see, e.g., Scharpf, 2000; Ferrera & Sacchi, 2005) in national and global digital contexts.

With regard to ad hoc collaboration, the four brightening contributions to the strategic management domain still share a common denominator. The reasoning is as follows. Individual actors (firms) plan resource allocation to compete and realise their interests in markets. *Collaborative* activity seems to be a feature of single firms' portfolios. In management theory, the capacity of a firm to cooperate and to exchange parts of production with global partners is discussed under various terms. Here, we

mention three of them: (1) collaboration capability (cf. Teece et al., 1997; Blomqvist & Levy, 2006), (2) strategic alliances (cf. Hitt, Ahlstrom, Dacin, Levitas, & Svobodina, 2004), and (3) portfolio of strategic networks (cf. Partanen & Möller, 2012). Still, in all three discussions, collaboration does not appear as a plural quality, not as different from individual achievement, and not as emerging from *multiple* actors' action. In this tradition, collaboration as a managerial capacity remains an attribute of a single actor. It thus becomes one of many attributes of central actor planning and management.

Strategic management is a composite academic field to which different disciplines (economics, sociology, marketing, finance, and psychology) contribute (see also Chapter 5). In contrast to organisational management that focuses on formal organisations, strategic management has a mixed tradition that ten years ago evolved into business policy (Hambrick, 2004). Yet, management scholars struggle with differences between the terms *corporate*, *organisational* and *strategic* management (cf. Hambrick, 2007; Nag, Hambrick, & Chen, 2007). With regard to the research direction, organisational management applies to any organisational actor, while corporate management refers to market corporations (cf. Coelho, McClure, & Spry, 2003; Wajcman, 2013; Gard, 2015), but strategic management applies to an intended and planned development of any unspecified actor by the leadership. And leadership is challenged by ad hoc collaboration in its traditional role.

To understand this we have to go back to older differences in the bases of organisation and management theory. Abandoning more ambivalent recent discussions (cf. Nag et al., 2007; Stacey, 2007) and following Astley and Van de Ven (Astley & Van de Ven, 1983; Van de Ven &

Hargrave, 2006) the approaches are still oriented along the lines of old debates that divide them into four groups (see Figure 2-1).

The groups are distinguished by their approaches. Group 1 has a system structured approach. Group 2 has a natural selection approach. Group 3 has a collective action approach. Group 4 has a strategic choice approach.

The old theories distinguish two axes, viz.

- an x-axis ranging from system voluntarism to individual voluntarism, and

- a y-axis ranging from micro-oriented to macro-oriented.

This results in the following compartmentalisation.

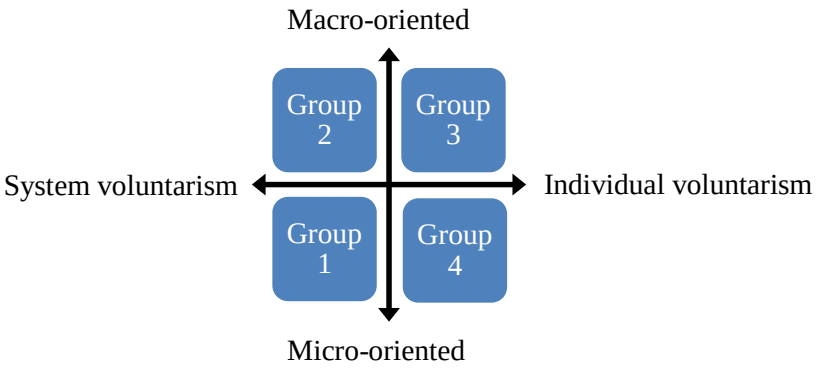

Figure 2-1: Approaches in organisation and management theory

Based on extensive analyses, the analytical outcome of the concepts leads to the following characteristics for each group.

Group 1: - deterministic worldview (structural functionalism)

- focus on micro behaviour, actor's role: reactive

Group 2: - strong determinism (natural selection)

- focus on macro phenomena, actor's role: inactive

Group 3: - methodological individualism (collective action)

- extended alliances and networks, actor's role: interactive

Group 4: - individual voluntarism (strategic choice)

- central actor perspective, actor's role: proactive

Group 4 is the traditional place of strategic management concepts. It is relevant to RQ 1. Close to it are different collective action approaches (group 3); both groups are relevant to answer RQ 1. The other two groups deny managerial for evolutionary perspectives. Here, we see system theory and theories of economic history.

Two basic conceptual orientations are important for managerial impacts.

(1) The more the managerial role (actor's role) is understood to be a central actor role (or an independent position of hierarchic command and control), the less it fits into polycentric, non-hierarchical relations, in volatile and ad hoc situations (see, e.g., Mintzberg, 1990; Watson, 1994; Weick & Sutcliffe, 2007).

(2) In voluntaristic oriented approaches, concise external information (on ex-ante given preferences) is a prerogative for strategic choice and collective action (Groups 3 and 4).

In sum, external actors and surrounding ecosystems appear in strategic management traditions as rather competitive and hostile worlds. Planning

and foresight are needed in strategic management to become faster than others in the market. In a quotation from strategic management scholars, 25 years ago, but still true today: *"The reason is that when they arrive on a market with a new product/service, such firms find the market pre-empted by more foresightful competitors, who had planned their strategic moves in advance"* (Ansoff, 1991, p.455).

Foresight in this sense (Figure 2-1, Group 4) means the ability to calculate one's own and others' interests as clearly as possible into the future. The managerial role of planning then depends on reliable information on recent trends and environmental structures, and on other actors' activities and priorities. The calculation of these parameters in a linear development allows strategic management to plan into the future: individual actors compete with others in predictable, linear growth processes in markets according to plans. Given fix preferences and a stable environment, speed equates to advantage and effectiveness. The managerial role is to speed toward the defined goal while best marshalling the available resources.

How does this affect managerial attitudes towards ad hoc collaboration? In this framework, collaboration has to consist of inter-organisational cooperation that depends on (1) the actors fix preferences and their set goals, (2) individual power to realise set goals against opposition, and (3) full initial information in decision making, for goal targeting and control.

2.1.2 *Foresight tradition*

Relying on foresight is a management method of systematic expert-based planning and decision support. As *technological foresight* (TF), foresight has become a prominent part of technology and research planning since World War II. Forms of foresight developed from technological forecasting for military purposes in the USA (see, e.g., Miles, Harper, Georghiou, Keenan, & Popper, 2008; Coates et al., 2010; Box, Jenkins, Reinsel, & Ljung, 2015) and gained worldwide momentum, with 'booms' of internationalisation in the 1990s (in the uncertainty of a new millennium). Corporate foresight also developed, as a monitoring and planning method for corporate actors (see, e.g., Daheim & Uerz, 2008; Linstone, 2011; Rohrbeck, 2012).

Foresight practices have been adapted to very different national cultures. While TF originated in the USA, it developed in substantially different ways in France (cf. Godet, 1986), Nordic European countries (see, e.g., Andersen et al., 2007), the UK (cf. Keenan & Miles, 2002) and Japan (cf. Kuwahara, 1999). However, foresight also became a transnational endeavour (cf. Popper, Keenan, Miles, Butter, & Sainz, 2007; Butter et al., 2008). Today, it is an important part of the EU's strategic management (cf. Becker, 2003; Pellegrin, 2007). European foresight activity (cf. Cuhls, 2003) has led to the formulation of 'grand challenges' and gave rise to research programmes such as HORIZON 2020 and diverse platforms for citizen participation[1].

[1] see http://forlearn.jrc.ec.europa.eu/guide/1_why-foresight/foresight-culture.htm

Forecasting and foresight are often confused. Technological foresight was developed from technological forecasting.[2] Martino defined a technological forecast as *"a prediction of the future characteristics of useful machines, procedures and techniques*" (Martino, 1993:1). Forecasts are calculations, on the basis of available data and technology.

Foresight, however, encompasses a *process* and is a *strategy* for coping with uncertainty. In conceptual traditions of technological forecasting, TF focuses on technological breakthroughs, risks and consequences (Linstone, 2002). TF provides decision makers with scenarios of potential futures to plan and prepare for. It aims to enable actors to decide, shape and make their future (cf. Popper, 2008; Linstone, 2011). As there are many TF designs, defining *the* foresight process is not viable.

Both technological forecasts, seen as calculations, and TF, as part of longer planning and decision making processes, support mindsets of technological progress and linear growth (see, e.g., Könnölä, Brummer, & Salo, 2007; Lin, Luarn, Maa, & Chen, 2012). With regard to planning, both rely on extrapolation of existing and past trends, and both tend to neglect anything other than technological factors, and here, back dropping technological or unpredictable social evolution (cf. Besiou, Stapleton, & van Wassenhove, 2011) did not appear in the calculations.

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[2] Here we note in passing that forecasting is different from predicting. A forecast relies on data from the past and presents an analysis of trends. It is an extrapolation of the past into the future (cf. Armstrong 2001). A prediction is a statement about the way things will happen in the future, often but not always based on experience or knowledge and closely related to uncertainty (Hazem & Mastorakis, 2008).

Only recently, destructive technologies (cf. Ayres, 2000; Van Notten, Sleegers, & van Asselt, 2005; Saffo, 2007) became a planning issue in a new generation of foresight research (cf. Cagnin, Havas, & Saritas, 2013). Debates over 'foresight 2.0' have recently revolved around disruption and improvisation (see, e.g., Van der Helm, 2007; Nelson, 2010; Heger & Boman, 2014; Weigand et al., 2014; Weber et al., 2015) and the integration of change and complexity in foresight approaches. These studies aim to adapt planning to the acceleration of societal dynamics.

In sum, turning to foresight for long-term planning and reduction of uncertainty in dynamic collaboration processes is straightforward (Weigand et al., 2014). So far, however, its use for ad hoc collaboration has been limited. TF's innate central actor perspective (cf. Miles, 2008) and expert-based approaches (cf. Landeta, 2006; Georghiou et al., 2008; Linstone, 2011; Linstone & Turoff, 2011) need time and considerable financial investment to fulfil repetitive expert rounds in reliable scenario development. Foresights are technical methods used to reach an identified audience. This involves high levels of investment. TF standards are too time consuming and resource intensive for use in real-time challenges.

Although foresight *studies* examine and support participative practices and principal agent problems (see, e.g., Cachia, Compañó, & Da Costa, 2007; Nugroho & Saritas, 2009; Lin et al., 2012; Markmann, von der Gracht, Keller, & Kroehl, 2012; Carabias, Moser, Wilhelmer, Kubeczko, & Nelson, 2014), foresight *methods* are guided and sponsored activities (cf. Gordon, Glenn, & Jakil, 2005) in hierarchical decision making and planning processes.

Public and corporate foresights serve a different leadership audience. Public foresights can be conducted in a general or in a special interest.

The aim is to furnish information for strategic planning of concerned actors in in the population. This includes, but is not limited to the support of private companies (see, e.g., Rohrbeck & Gemünden, 2011). In contrast, corporate foresights provide businesses with specific knowledge about their branches, markets and future developments (cf. Wilhelmer & Nagel, 2013). For both domains, scenarios of medium-to-long-term range are produced. Support for planning and decision-making is offered without producing the decision itself.

In our digital age, public administrations and corporate actors struggle with an information abundance, time scarcity and parallel real-time issues. The future seems closer than before as product life cycles as well as the span of a human generation shrink. Technological change is no longer the only acknowledged factor for change: society and ecosystems have also been recognised as change drivers (see, e.g., Bijker, 1997; Welsh & Krueger, 2012; Battilana & Casciaro, 2013).

TF has achieved sound standards, but society has changed and traditional boundaries between public and private sphere, time and space are melting. The complexity of problems triggers public-private and cross-sector partnerships (cf. Rangan, Samii, & Wassenhove, 2006; Schuppert, 2008; Andonova, 2010) in search of tri-sector solutions (see, e.g., Richter, 2004; Gay & Dousset, 2005; Selsky & Parker, 2005). The conclusion is unavoidable: future planning has become impossible without multi-sector collaboration and the inclusion of heterogeneous *affected* and *interested* actors (for new solutions see Chapter 6).

2.1.3 *Initial planning, linear process and methodological individualism*

Here we briefly review the preceeding sections before we move on in search of collaborative management concepts. Methodological individualism influences planning and management far beyond the market place. Strategic management mainstream theory tradition (Group 4) is built on individual choice concepts adverse to ad hoc collaboration and networked situations. Strategic management follows traditions of (1) central actor perspectives, (2) initial information to calculate own and others' preferences, (3) projectable linear processes, and (4) time for ex-ante planning. The managerial role is to allocate resources and to control if not linear then at least predictable processes to meet ex-ante set goals. Planning and management traditions therefore are in conflict in situations involving (1) scarce or overwhelming information, (2) multiple autonomous actors and (3) a need for ad hoc (re-) action.

Foresight approaches have established processes to cope with uncertainty and to look into various medium-to-long-term futures, but so far, foresights have been tailored to support the ex-ante planning of central actors and single corporations. To advance management and decision making to plurality, greater levels of complexity and much greater speed, public and corporate foresights need to change (cf. Tuomi, 2012). Below are three reasons for such a change.

(1) The *central actor* perspective is blind to the diversity of interests in collaboration. The central actor perspective is not useful in dynamic collaboration processes where many activities overlap but do not merge into one task. To enrol independent actors in polycentric co-production

instead requires different interests to be taken into consideration. Therefore, polycentric instead of central actor perspectives have to become the starting point for foresight.

(2) TF extrapolates *expert opinions* relying on past trends in rather stable environments and with present stakeholders. More improvisation, contingent elements, unexpected and deviant incidents have to be expected in dynamic innovation processes (cf. Swan & Scarbrough, 2005; Bakker, 2010). Local realities, unforeseen changes and actor fluctuations should be added to scenario planning.

(3) The most fundamental mismatch, still, regards the foresights' temporal placement in ex-ante planning. *Extensive planning periods* contradict spontaneous interaction, block response speed and hinder readiness to participate in emerging innovation networks.

2.2 From traditional management to real-time collaboration

What follows is an investigation of collective action and network theories to find components for collaborative management in ad hoc situations that surmount the limitations of strategic management and foresight. Networks were long ago positioned as a third mode of governance between market and hierarchy (cf. Powell, 1991), but for leadership, the 'network paradox' is that while networks help to cope with complexity, they also add complexity to managerial activities (see, e.g., Rief, 2008).

The discussion starts (2.2.1) with collective action approaches (see Table 2-1, Group 3) in order to explain *multiple actor* management models, and then turns to network theory (2.2.2). Here, we first distinguish static from dynamic network approaches. Section 2.2.3 discusses social

network analysis (SNA) and section 2.2.4 actor-network theory (ANT). Both dynamic network approaches can model change over time. Section 2.2.5 discusses how collective action and network process components contribute to the management of collaborative dynamic processes.

2.2.1 *Collective action approach*

With regard to ad hoc collaboration, collective action theory proffers two streams that are as powerful as they are divergent: (A) the institutional approach, and (B) the more traditional collective action approach that is provided by game theory and the rational choice approach (cf. Flanagin, Stohl, & Bimber, 2006). A combination of these two conceptual streams is (C) Elinor Ostrom's (2005) real-world approach.

A: The institutional approach

The institutional approach is based on the following perspective on collective action (see also Figure 2-1, Group 3). It starts from concepts of an aggregation of single actors' interests in organisations of similar preferences. Astley and van de Ven (1983, p.:251) assumed that "*the collective-action view focuses on (…) interdependent, yet semi-autonomous organisations that interact to construct or modify their collective environment, working rules, and options. The manager's role is an interactive one. He transacts with others through collective bargaining, negotiation, compromise, political maneuver, and so on. Movements toward solutions are guided by norms, customs, and laws, which are the working rules of collective action."* The managerial role in collaboration here is to mediate a plurality of norms and customs: different practices and 'working rules' hold for different organisations. In more recent literature, economic institutionalism (cf. Williamson, 2000), technology innovation

management (cf. Ahuja, 2000), social movement studies (cf. Davis, McAdam, Scott, & Zald, 2005) and the 'Indiana institutionalism' scholars (cf. Kiser & Ostrom, 2000; Janssen, Goldstone, Menczer, & Ostrom, 2008; Powell & DiMaggio, 2012) follow this scientific tradition.

B: The collective action approach

In its more powerful theory tradition, at least for strategic management, collective action draws from formal arguments and game theory. In experimental and formal scientific traditions, the approach established a sceptical view on collective action, based on rational choice and behaviourist arguments (see, e.g., Turner, Maryanski, & Fuchs, 1991, p.356). Collective action here is a *dilemma* for the rational, self-interested individual (and organisation). From Olson (1965) to Hardin's (1971) famous 'prisoner dilemma' this theoretical frame has a peer tradition in Machiavelli's and Hobbes' political concepts (see, e.g., Arendt & Jaspers, 1955): lone individuals are seen as 'wolf-like' to one another, though in a shared world.

From a managerial perspective, if maximising self-interest according to hierarchic preferences is natural, then acting towards a *common* interest just keeps actors from their individual goals. If this is so, it is neither rational nor probable[3] to collaborate, unless forced by external coercion, or unless kinship persons are involved (cf. Hardin, 1971; Sandler, 2004).

[3] The linear utility function, U1=U1 ((E-x1)+AxP (Ex1)) serves to predict outcomes as rational choice standard equation for competitive market situations.

This sceptical position towards collective action spread as a ‘zero contribution thesis’ in strategic management and established distrust in spontaneous collaboration (cf. Caliendo et al., 2012).

The collective action concept of rational choice (cf. Katznelson & Weingast, 2005) allows for complex simulations. Different actors’ preferences can be simulated in various modes. Its formal strength is helpful for scenario planning, but it is of little use to advance real-time collaboration under conditions of uncertainty. For real-time application, formal models need preliminary information. Prioritised interests of single actors in stable environments or linear development are replicated. Collaborative *process and context dynamics* between heterogeneous unfamiliar actors cannot be guided this way. So, it is necessary to look for other approaches.

C: Ostrom’s real-world and institutional approach

Elinor Ostrom, economist and pioneer of the Indiana school of institutionalism, discovered context and process factors that “affect the likelihood of successful collective action” (see, e.g., Ostrom, 1990; Ostrom, 2000) behind the utility functions of individual and collective choice frames (see Table 2-1, group 4 and group 3). Her central findings were that:

(a) in real-world collaboration multiple *types* of individuals do exist. Some individuals are more willing than others to initiate reciprocity and collective action: there are “norm-using players” and “rational egoists”, and a large variety of degrees between them (see, e.g., Ostrom, 1996; Ostrom, Poteete, & Janssen, 2010).

(b) their *ratio* is volatile and *changes* in *collaborative processes* depending on learning over time (Janssen et al., 2008). The evolution of social norms in long-term collaboration is described as a *dynamic structure* (Ostrom, 2000).

Briefly summarised from a central publication (Ostrom, 2000, p.149-154), successful collaboration or co-production depends upon:

(1) the quality of group communication (real-world, or tweets and feeds),

(2) self-imposed sanctions,

(3) believers in others' contribution, as these are most likely to contribute by themselves,

(4) continuous local involvement.

Successful collaboration is hampered by:

(5) migration, in particular, an influx of foreigners and efflux of locals can have negative effects,

(6) global-local encounters, as according to many studies, local successful initiatives often die off in the face of international and global involvements, and of interaction.

Subsection conclusion

From these findings, rich empirical accounts of context and process factors offer evidence-based *principles* for management that confront the older collective action tradition. Real-time and real-world dynamics advance institutional perspectives and re-activate collective action debates. By introducing variables of space and time, locality and temporality, collective action simulations were also improved considerably (Ai, Comfort,

Dong, & Znati, 2015). In defence of Hardin's (1971) approach, scholars have also conducted empirical studies (cf. Sandler, 2004; Francisco, 2010) and the collective action debate remains open.

2.2.2 *Network theory*

The ubiquitous Internet experience of "being linked" (cf. Barabasi, 2003) and "living in a small world" (Watts & Strogatz, 1998) brought new attention to network concepts around the millennium. Network analyses stem from very different disciplines including biology, computer sciences and sociology (Turner et al., 1991, p.540-572). The basic assumption is that the position of an element or actor in a *network* of others determines shape, status and future development. In the social sciences, Granovetter's (1973) work, as inspired by Polanyi (1944), paved the way for social network analysis (SNA): he first analysed actors in their "embeddedness" in terms of "strong and weak ties" (Polanyi, 1944; Granovetter, 1973; Granovetter, 1983).

Ties are relationships among actors that provide opportunities and constraints for behaviour. So network theory leaves the pure realms of *the individual: "This perspective differs from traditional perspectives in organisational studies that examine individual actors in isolation. The difference is the focus on relations rather than attributes, on structured patterns of interaction rather than isolated individual actors."* (Brass, Galaskiewicz, Greve, & Tsai, 2004, p.795). This transcends the central actor concepts in strategic management.

Traditional network theory examines structures of homogeneous nodes and ties (see, e.g., Stegbauer, 2010) to describe a networks' size and structure. Structural models, however, do not capture change over

time (see, e.g., Trezzini, 1998). This conceptual limitation was early recognised (cf. Granovetter, 1983; Burt, 2004) but remained, for a long time, unsolved.

In recent network literature, adaption, evolution and change of networks are addressed (see, e.g., Day, Junglas, & Silva, 2009; Slotte-Kock & Coviello, 2010; Korsgaard, 2011; Parmigniani & Rivera-Santos, 2011). Different explanations stem from pathway approaches (cf. Sydow, Windeler, & Möllering, 2002; Sydow, Schreyögg, & Koch, 2009), science and technology studies (cf. Law & Callon, 1992; Bijker, 1997; Orlikowski, 2009), diffusion of innovation approaches (cf. Rogers, 2010) and generally, from studies on innovation networks (cf. Gloor, 2005; Koller, Langmann, & Untiedt, 2006).

Two dynamic network approaches stand out as ways to investigate dynamic innovation processes. To study change over time, *social network analysis* (SNA) employs agent based time series (cf. Jun, 2012). Simulating multiple single actors' development in a network is extremely useful for scenario building. *Actor-network theory* (ANT), the second dynamic approach, takes a 'real-world' stake, the method being to analyse the practices of emerging macro-actors (networks). Apart from on rare occassions, these dynamic network approaches are used independently (cf. Peuker, 2008). They offer divergent perspectives on ad hoc collaboration in positivist and constructivist traditions. The network level and individual level influence each other in terms of, for example, inter-personal, inter-unit or inter-organisational ties. Using both analytical methods, dyads, triads, and network sub-regions can be investigated.

2.2.3 *Social Network Analysis*

In social network analysis (SNA), data for network transfers (cf. Singh, Tan, & Mookerjee, 2008) can be obtained: (1) at a network level, measuring size, density and connectivity; (2) at a node level, measuring distance and prominence, closeness and degree of centrality; and (3) at a tie level, measuring directedness, strength or weakness. Abundant network measures in various software applications exist (cf. Huisman & van Duijn, 2011). Ties in an SNA channel quantifiably transfer a *flow* of resources. In this respect, SNA overlaps with dynamic systems approaches (see, e.g., Besiou et al., 2011) where whole ecosystems are modelled. The method provides means for understanding dynamic relations and allows digital visualisation of complex processes. SNA studies advance our understanding of *"how structural properties influence observed characteristics and associations among characteristics"* (Wasserman & Faust, 1994:6-9).

However, SNA needs a large amount of ex-ante input. Information on and definitions of relations (formal or informal) and actors (persons, organisations and others) are indispensable to run a simulation. Nodes and ties remain units of investigation in SNA time series. While changing values for metric units lead to an increase or decrease in parts of the model, the kind of node or tie will not change over time. SNA supports insights into potential futures, but so far, it cannot capture how and why *dynamic* innovation processes succeed. Therefore, simulations cannot advise how unpredictable and non-linear real-time processes should be handled, or how disruptive and emergent properties are kept together over time (Van der Maaten, Postma, & Van den Herik, 2009).

2.2.4 *Actor-network theory*

Actor-network theory (ANT) retraces empirical network operations. Thus it enables the exploration of past collaboration and innovation processes. ANT developed from the 'science and technology studies' (STS) by Callon, Latour and Law (see, e.g., Callon & Latour, 1981; Callon, Law, & Rip, 1986), scholars who aimed to investigate the interplay of technology, knowledge and innovation (cf. Scacchi, 2005). Instead of homogeneous nodes and ties, *macro-actors* become the unit of analysis, and ANT analyses volatile nets between *heterogeneous* entities. *Human* and *non-human* actors are analytically included (Avgerou, Ciborra, & Land, 2004); for example, a school class analysis entails interviews with pupils and teachers, but also the investigation of school computers, laboratories, buildings, software used, education policy and teaching practices. In disaster management, interviews with aid organisations, affected people and donors would be obligatory, yet, the examination of affected livelihoods, destroyed infrastructures, governmental disaster acts, fibre glass boats and collaboration practices between all theses actors would also be necessary.

The ANT pioneers rejected dualism (nature-culture, subject-object, et cetera) and focused on practices. Therefore, networks and actors are seen as socio-technical "hybrids" (cf. Callon, 1986; Callon et al., 1986; Latour, 1999; Tatnall, 2011). An actor role is assigned to objects and subjects that *influence* others, in physical or symbolic ways (see, e.g., van Mierlo, Leeuwis, Smits, & Woolthuis, 2010). Thus, in contrast to positivist SNA frames, ANT allows no external, 'as-from-above' perspective. Analysts have to "follow the actor" to retrace the different network practices (cf. Dant, 2005).

Furthermore, actor-networks are assumed to be instable. Without continuous mobilisation they fall apart. ANT scholars therefore tried to find out why *some* interactions *"more or less succeed in stabilizing and reproducing themselves"* (Law, 1992, p.380). They found that to exist as an actor-network, a *translation process* between heterogeneous *interests* occurs (cf. Callon, 1986). The term *translation* makes all the difference to the above theory traditions: SNA (cf. Mueller-Prothmann & Finke, 2004), system dynamics (cf. Besiou et al., 2011) and innovation diffusion (Rogers, 2010) all speak of *transfer*. In contrast, ANT scholars hold that there is *no* transfer and input is always *modified* by other actors' interests. The enroled actors alter the translated interests (see, e.g., Pollack, Costello, & Sankaran, 2013). Collaboration and network emergence therefore are *"somewhat uncertain processes of overcoming resistance – rather than a fait accompli or a noun"* (Law, 1992, p.380). Finally, actor-networks are *effects* of social practices, not their causes.

Holding that *"an actor is also, always a network"* (Law, 1992, p.384; Latour, 2012), a network analysis starts with the choice of perspective. Successful network emergence leads to *punctualisation* (see, e.g., Austrin & Farnsworth, 2005): the making of the heterogeneous actor-network becomes invisible behind a successful network. It is *punctualisation* that makes networks and macro-actors real-time effective and powerful.

In sum, ANT enables the examination of ad hoc collaboration and dynamic innovation processes as network emergence and evolution. ANT crosses the boundaries of traditional management and organisation theory domains (see Table 2-1) using a dynamic network perspective. It merges voluntaristic and evolutionary managerial components and micro- and

macro perspectives. The translation concept helps to understand collaboration dynamics (cf. Pollack et al., 2013). Translation is defined in definition 2-1.

Definition 2-1: Translation

Translation is the process of network evolution and consists of four basic moments: (1) Problematisation, (2) Interessement, (3) Enrolment and (4) Mobilisation. (Tatnall, 2011)

Table 2-1 contains the four operations of network emergence (left column) and management activities that relate to the network formation moments (right column). It shows how (a) strategic management elements (interests) and (b) more evolutionary, systemic-driven dynamics melt in the approach.

Table 2-1: Actor-network evolution and management activities

ANT operations	**Related management activities and network practices**
Problematisation	Identification of specific problems; identification of actors involved in a problem in real-time (socio-technological hybrids).
Interessement	Practices to identify and attract interest, define and create linkages between actors' interests, translate different interests; heterogeneous actors' interests have to be channeled through an "obligatory point of passage" (OPP) to become a network.
Enrolment	Negotiation of interests; practices to encourage heterogeneous actors' commitment to 'enrol' in common network activities, use of boundary objects.
Mobilisation	Activating old and new allies for the aligned interests; continued practices to stabilise a reversible and dynamic network.

A final *moment* in *interessement* is crucial for a translation process: to become a network, the interests of heterogeneous actors have to be channelled through an OPP, an "obligatory point of passage" (Callon, 1986; Stanforth, 2006). If an OPP (a contractual event, informal meeting or factual agreement) fails in some respect, it becomes unlikely that the actors

will enrol in common network activities. The OPP designates a moment that has to happen in order to align interests and to establish a dynamic innovation network. To define the OPP makes network-actors become *focal actors* (see Def. 1-9).

Heterogeneous networks need objects that are "*able to mediate diverse actor worlds"* (Briers & Chua, 2001, p.240), called 'boundary objects'. Such artefacts can be anything from technological devices to consumer goods and symbolic artefacts such as words, claims, events, or pictures.

Ongoing network 'mobilisation' remains necessary to continue the contingent and always reversible collaboration. To stabilise actor-networks over time, the inscription of practices in *materials* and institutional *routines* has to follow (cf. Stanforth, 2006).

2.2.5 *Collective action and network process components*

This section deals with the literature review on collective action and network theory. Central actor planning for individual or collective interests does achieve efficient *coordination.* Thus, it can hinder reciprocity and trustful cooperation (cf. Abdessalem, Cautis, & Souhli, 2010) and it may even mislead people in a more complex *collaboration*. It ultimately inhibits ad hoc collaboration. Strategic management traditions are thus a poor fit with digital networked environments and rather block the processes of emerging "polycentric and dynamic co-production to sustainable ends" (cf. Ostrom, 1996). Dynamic structures or working rules that only emerge from collective action do not exist in advance of, or external to, collaboration, so, they are not available as information in advance. This uncertainty hampers the initiation of collaboration for many actors.

Assessing the impact of collective action and network concepts for the management of real-time collaboration, this study found that static network approaches and individual choice approaches remain without an adequate answer. Although they are arguably better than management and foresight traditions because they include multiple actors and a lateral management structure, dynamic governance elements are still absent from the literature.

However, positivist SNA and constructivist ANT offer ways to examine the collaborative management of non-linear ad hoc processes over time: positivist SNA allows us to simulate future changes of nodes and ties, whilst constructivist ANT allows us to reconstruct the emergence of real actor-networks.

Regarding *planning and management* of real-time collaboration, the first approach supports forecasting (cf. Hahn, Meyer-Nieberg, & Pickl, 2009; Jun, 2012) while the second can inform foresight processes. The two dynamic network approaches diverge considerably (cf. Peuker, 2011) in terms of: (a) focus on structure or process (b) narrow (homogeneous) or open (heterogeneous) actor definitions, and (c) external or follow-the-actor perspectives.

When seeking to advance traditional management concepts to dynamic real-time collaboration in digital societies, ANT has more to offer: (1) the open actor definition allows us to assess socio-technical actors' roles (for example IT infrastructures) in collaboration; (2) components for the evolution of dynamic innovation networks (DINs) are offered (see Table 2-1); (3) the interests of actors are conceptualised and bring the management perspective into the network process.

2.3 A different management for ad hoc collaboration

This section draws an interim conclusion concerning traditional management and ad hoc collaboration concepts. So far, the study has reviewed strategic management (2.1.1) and foresight traditions (2.1.2), and investigated components of collective action (2.2.1) and network theory (2.2.2, 2.2.3, 2.2.4) that have a bearing on collaborative management. It has distinguished static and traditional collaboration concepts (2.1.3) from dynamic ad hoc ones (2.2.5), and through this examination it has become clear where strategic management traditions and spontaneous ad hoc collaboration are opposed, highlighting precisely where ad hoc collaboration challenges traditional management.

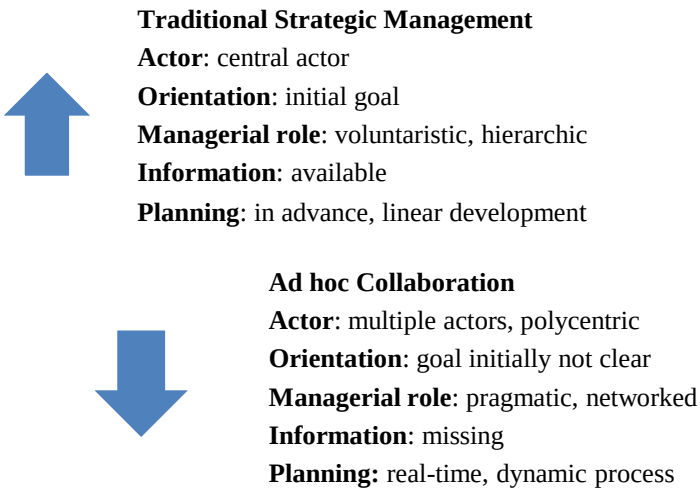

Figure 2-2: Opposing items of traditional strategic management and ad hoc collaboration

Figure 2-2 points to the differences between hierarchic management and networked reality. Traditional management fails where uncertainty and time pressure play important roles, because of the conceptual bias inherited from opposite demands. Finally, this section has pointed out that traditional strategic management concepts can not instruct leadership when faced with a practical challenge.

2.4 Ad hoc collaboration in dynamic innovation networks

Recent entrepreneurship and management research has identified innovation networks as the answer to complexity and real-time competition in the 21st century (cf. Weick & Sutcliffe, 2007; Prahalad & Krishnan, 2008; Baldwin & von Hippel, 2011; Maurer & Valkenburg, 2014). Research is increasingly devoted to the study of innovation clusters and networks (cf. Porter, 2000; Gloor, 2005; Hamdouch, 2010; Partanen & Möller, 2012). This happens to be the case in (a) organisational management (cf. Powell, Koput, & Smith-Doerr, 1996; Powell et al., 2005), (b) innovation management (cf. Ozgen & Baron, 2007), and (c) disaster management research (cf. Meesters & Van de Walle, 2014; Ai et al., 2015; Kapucu, 2015).

The main areas of potential discussed relate to the clustering of technology sectors. ICT, biotechnology, nanotechnology and the defence industries in particular have already attracted the interest of governments and private actors (cf. Romanelli & Khessina, 2005; Robinson, Rip, & Mangematin, 2007). Among scholars, there is increasing evidence that competitiveness in a global economy ironically relies on the “local

things" (cf. Porter, 2000). While considerable investigation has been devoted to understanding this 'localisation' and materialisation of global innovation processes (see, e.g., Orlikowski, 2005; Orlikowski, 2009), less attention has so far been paid to temporal dimensions of collaboration, the dynamics of non-linear innovation processes.

To speak of emergent practices is clearly not new. The 'strategy-as-practice' movement (cf. Jarzabkowski, 2004; Johnson, Scholes, & Whittington, 2008) draws more largely on the 'practice turn' (Schatzki, Knorr-Cetina, & Von Savigny, 2001) for at least two decades. But only little attention has been paid by mainstream perspectives of strategic management to these theoretical concepts, while innovation research has become a standard field of recent economic theory.

Recently, public and private actors aim to support innovation networks. However, that support often did not lead to success (cf. Backhaus & Büschken, 1997). Looking at the results of Figure 2-2, we know better why: there are opposing items in traditional strategic planning and ad hoc innovation collaboration. Three important differences are: (1) innovation networks are not deliberatedly 'created' by any side, (2) they are not the result of initial planning by central actors (cf. Jones & Lichtenstein, 2008), and (3) they are not controllable and 'manageable' in 'goal targeting' ways (see, e.g., Weber et al., 2014).

To learn more about successful dynamic management and governance structures, it is necessary to investigate cases where they have worked in a highly dynamic field. Below, the study therefore introduces the case of DINs in global disaster management (2.4.1). Observation of this high-velocity environment ultimately opens up the prospect of a turnaround from traditional strategic management (2.4.2) to a new foresight (2.5).

2.4.1 *The case of DINs in disaster management*

A response to global disasters and thereafter the long-term rehabilitation of the environment is a dynamic process with potential for a great deal of innovation. What we are used to seeing is rather ineffective management by which this potential is often lost. Many textbooks on crisis management offer examples of both unsuccessful (see, e.g., Weick, 1996) and of successful management. The latter are based on ad hoc collaboration in fast changing environments (see, e.g., Jenkins, Gremillion, & Nowell, 2010; McGilvray & Gamburd, 2010; Sheperd & Williams, 2014; Sword-Daniels, Twigg, & Loughlin, 2015).

This thesis argues that global disaster management mirrors the identified problems of traditional management in real-time collaboration. In the post-disaster period, opportunities emerge for innovation from the destruction of the former dominant structures (cf. Schumpeter, 1934). Seen as an ad hoc and real-time process, crisis management is described as *"the art of making decisions to head off or mitigate the effects of crisis often while the event itself is unfolding"* (Mossalanead, 2008, p.82). Considering the managerial antipodes depicted in Figure 2-2, it is now possible to state that we understood the conceptual misfit in a practical field.

In the above described strategic management traditions, crisis management is seen as a process of different stages (see, e.g., Pearson & Clair, 1998; Green, 2000; James, 2011). Although, there exist a different number of stages and technical terms in the literature and practice (cf. Dorasamy et al., 2013) there is consensus on three basic managerial stages: response, recovery, and preparedness (see, e.g., Quarantelli, 1988; Fazarmand, 2007; Lalonde, 2011). Those three stages involve different actors, different steps of intervention, and different technical expertise.

In spite of highly organised professional transnational aid structures, increasing technical standards (Acar & Muraki, 2011; Wukich & Steinberg, 2013) and rising public participation via social media and mobiles (Perng et al., 2012), we observe that humanitarian missions often fail to achieve local sustainable ends. Moreover, after the emergencies, there are enduring crisis periods that have to be lived through (cf. Pearson & Clair, 1998; Twigg & Steiner, 2001; Majchrzak, Jarvenpaa, & Hollingshead, 2007; James, 2011; Sheperd & Williams, 2014).

In the crisis management literature, the problem of cooperation and collaboration is an 'all-time high' topic. Although various network studies and foresight studies describe efficient collaboration in emergencies (cf. Drabek & McEntire, 2003; Turoff et al., 2013) and networks (cf. Comfort et al., 2013; Kapucu, 2015), long-term relief and successful innovation collaboration rarely receive research interest (cf. Twigg, 2006; Olshansky, Hopkins, & Johnson, 2012). This fact is all the more surprising since the bulk of public and private investment falls into this relief stage. First in research, then in practice, global relief management is fragmented into (a) goals which are often context free, and (b) short-term goals (see, e.g., Buchanan-Smith & Maxwell, 1994; Sperling, Remington, Haugen, & Nagoda, 2004; Jenkins et al., 2010).

However, in crisis management research, SNA studies have the upper hand. They draw from the traditional strategic management concepts: in most network studies, homogeneous actors (and nodes, and ties) are compared (cf. Balcik, Beamon, Krejci, Miramatsu, & Ramirez, 2010). Central SNA studies on crisis management (cf. Comfort et al., 2004; James, 2011) focus on such inter-organisational cooperation: cooperation is examined

as a problem of individual actors based on simulation of demand and supply in linear curves that disband when a disaster is over. Cooperation only occurs in the intersection of the linear curves: that is later, namely, once demand and supply take on equal values once again. The individual choice model (see Figure 2-1) behind the traditional strategic management concepts was presented earlier. Suffice it to say here that conceptual traditions actually influence management analyses and collaboration practice but do not address the described managerial gap.

In contrast to SNA studies, real-time relief processes do not just depend on organisational actors of humanitarian aid. They mainly depend on multiple heterogeneous actors, such as public and private donors, local communities, infrastructures, media coverage, and many other heterogeneous actors during their long-term local rehabilitation.

Worthy of particular note are studies on Hurricane Katrina in 2005 which demonstrate how much routine ex-ante planning hinders local flexibility, sense making and real-time improvisation (see, e.g., Wachtendorf, 2004; Weick & Sutcliffe, 2007). Cascading real-time problems, such as sanitation needs arising from a lack of usable water – are invisible at the beginning. They cannot be planned for, but need a real-time response. Under the pressure of time, when collaboration is most important, horizontal management perspectives and long-term orientation are repeatedly lost (cf. McGilvray & Gamburd, 2010) in favour of new management routines, either traditional or ad hoc.

In conclusion, new models and methods are required to better understand and conceptualise dynamic long-term processes of successful collaboration. With regards to the previously mentioned methodological misfit, this study claims that traditional management repeatedly led to

ambivalent results as a consequence of effective short-term operations; moreover, it led to the misfiring of comprehensive and local sustainable rehabilitation in the longer term (cf. Sellnow, Seeger, & Ulmer, 2002; Boin, 2009; Schulz, 2009).

In global disasters in this millennium (Tsunami 2004, Katrina 2005, Haiti 2010, Hayan 2013, Nepal 2014, Ebola crisis 2014/15), the transnational global aid structure has evolved considerably (Donini, 2012). Global players of transnational aid and non-government organisations (TNGO) meet and support smaller local NGOs (LNGO) in disaster prone regions on affected sites. There is detailed and hierarchic top-down management of most processes in traditions of command and control. This approach is challenged by the new IT driven public participation of local communities and virtual observers. In the technological challenge, some actors see an enormous potential to change the traditional management styles: the inclusion of social media capacities could enhance collaboration and co-creation – towards sustainable ends, and in ad hoc relief.

2.4.2 *The turnaround from strategic management*

Traditional management contains elements that counteract successful ad hoc collaboration. In answer to RQ 1 this study has identified five conceptual barriers that hinder dynamic collaboration processes and ad hoc network emergence. It here proposes a managerial turnaround regarding the identified five opposite items (see Figure 2-2) in order to prepare the world of disaster management for collaborative innovation processes. Management has to abandon (1) central actor perspectives, (2) initial goal setting and initial resource allocation, and (3) the implicitness of full in-

formation, and has to embrace (4) a lateral instead of hierarchic managerial role and (5) the switch from planned cooperation to real-time collaboration.

In practice, this means the following. Ad hoc collaboration can mean mass-collaboration and co-creation with many and varied actors in a location. This will "signal" (Giones & Miralles, 2015) the interests of each actor to the others so that the right ones, those which are highly critical, may be matched. According to collective action (cf. Ostrom, 2010), finding and mobilising engaged co-operators in co-creation is nothing more than identifying the 'norm-using players', rather than staying with 'rational egoists' in real-time collaboration.

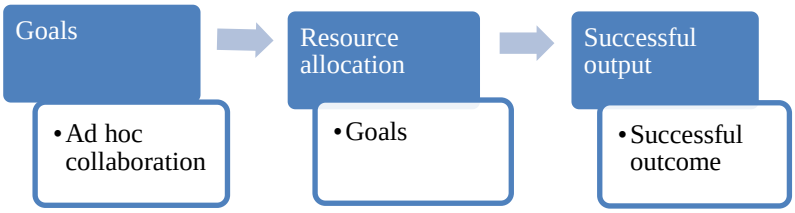

Figure 2-3: Opposed processes of strategic management and ad hoc collaboration

In unexpected challenges, dynamic processes and ad hoc collaboration all show themselves in different vistas. Instead of targeting identified goals over a set period of time, management has to *start* collaboration from an unexpected point in time, without clear goals, and even without familiar infrastructures and controllable partnerships. The collaboration with multiple heterogeneous and new actors stems not from choice but from the local and global reality of the status quo.

The conceptual (about) and practical (when) management situations are depicted in three offset process steps in Figure 2-3.

An important difference is that the dynamic process starts from collaboration, not from planning. Immediately after the start, parallel real-time activities begin to achieve an outcome. The 'trigger point' for the start might be a disaster that has occurred, or a market disruption that requires immediate response. From this moment, all interactions begin.

The process unfolds and is not controllable from a central point over time. Still, real-time collaboration intends to achieve successful ends. In contrast to a process towards a predictable end or goal, we see that in innovation processes, the successful end is not exactly clear at the beginning or throughout the dynamic collaboration process, but particular goals will be defined, reached and reset depending on the emerging collaboration.

Two different management modes are legitimated. They are guided by opposite contextual requirements, challenges and managerial motivations. The first mode is ingrained in our managerial routines (from experience). Then, on the spot, leadership has to be learned and developed. Using that capacity, it is possible to switch to the second mode.

The described dynamic course of action under conditions of uncertainty is characteristic of innovation processes (see, e.g., Sarasvathy, 2001; Sarasvathy & Venkataraman, 2011). To begin to provide an unexpected support to a terrible disaster is to start without an already existing concrete goal and predictable tasks. The intriguing questions are: how to start ad hoc collaboration, but with long-term perspectives into an unpredictable future; and how to manage the dynamic collaboration process successfully.

2.5 In search of a new foresight

Foresight concepts have a specific potential to direct short-time perspectives into long-term orientation (see 2.1.2). From its beginnings, *"…foresight is a process by which one comes to a fuller understanding of the forces shaping the long-term future which should be taken into account in policy formulation, planning and decision making"* (Coates, 1985, p.343). However, from the above sections, we also know that traditional TF has no grip on real-time collaboration (cf. Cunha et al., 2012).

For non-hierarchic collaboration, we see that in recent studies, scholars integrate network perspectives (cf. Nugroho & Saritas, 2009; van Mierlo et al., 2010; Heger & Boman, 2014; van der Duin, Kleinsmann, & Valkenburg, 2014) into foresight processes to stimulate more lateral planning modes. However, for our purpose of improving management of ad hoc collaboration, this is not sufficient. Planning as an initial 'upstream' period is no longer practicable when situations require immediate interaction (see Figure 2-2). A real-time foresight mode therefore would mean a switch from planning to readiness. Awareness of the working rules and requirements of ad hoc collaboration will be the mark of a new foresight mode, one which is designed to employ dynamic innovation processes from the very beginning.

The "working rules" (see Ostrom et al., 2010) of collective action (see 2.2.1) already partly exist in social norms and partly in dynamic collaboration patterns (cf. Park, 2015). Order in dynamic processes manifests itself in patterns of interaction which emerge in irregular, but repetitive and similar forms (cf. Burnes, 2004) in processes of self-organisation (cf. Maurer & Valkenburg, 2014). Dynamic processes are governed by the

ordering of the generating operations (cf. Ostrom, Walker, & Gardner, 1992; Branzei, Dimitrov, Pickl, & Tijs, 2004; Sydow et al., 2009).

To identify temporal patterns (network dynamics) that enhance successful and innovative collaboration, we need to explore: (1) DINs (cf. Hakansson & Snehota, 2006; Chen & Vang, 2008), (2) their emergence, and (3) their evolution as best practice cases of successful collaborative management (see Def 1-4). Only empirical investigation of successful collaboration processes allows us to identify governance patterns. The comparison of network patterns in several cases leads to the confirmation of generic facilitators of DINs. Then, in a later step, the patterns lead to their potential formulation as management principles, and can be used for crafting new tools and foresight methods that may support actors in successful lateral governance processes (see more detail in Chapters 3 and 4).

DINs are observable in many different settings of social complexity, uncertainty and multi-stakeholder dynamics (cf. Parmar et al., 2010; Hörisch, Freeman, & Schaltegger, 2014), but this thesis (see Chapter 6) focuses on two different societal settings: (a) the context of global disaster management and (b) the context of start-ups, business incubation and co-creation. The challenge of ad hoc collaboration by heterogeneous actors is a potential starting point for DIN emergence.

To consolidate the results of this chapter and to pave the way forward in the managerial field, Figure 2-4 shows the research rationale for the study, namely that three mismatches in the managerial field hinder successful ad hoc collaboration. Based upon the research rationale, the study adopts three goals, as set out below, and uses them to develop a collaborative real-time foresight.

1. The end of the mismatch caused by management and foresight traditions

The study aims to end the mismatches that occur particularly in temporal dimensions of management between time pressure and planning routines and result in conflicts between ad hoc action and *sustainable and innovative* outcomes; there is a rationale to insert long-term orientation into ad hoc collaboration.

2. The end of the governance mismatch

The study aims to end the governance mismatch between hierarchic management traditions and new networked, non-hierarchical collaboration settings by proposing a rationale for a polycentric process management of heterogeneous interests and actors.

3. The end of the mismatch between data collection, analysis and reality

The study aims to end the mismatch between static measures and non-linear processes by proposing a rationale for big data and long-term studies to obtain empiric evidence on successful innovation processes and patterns.

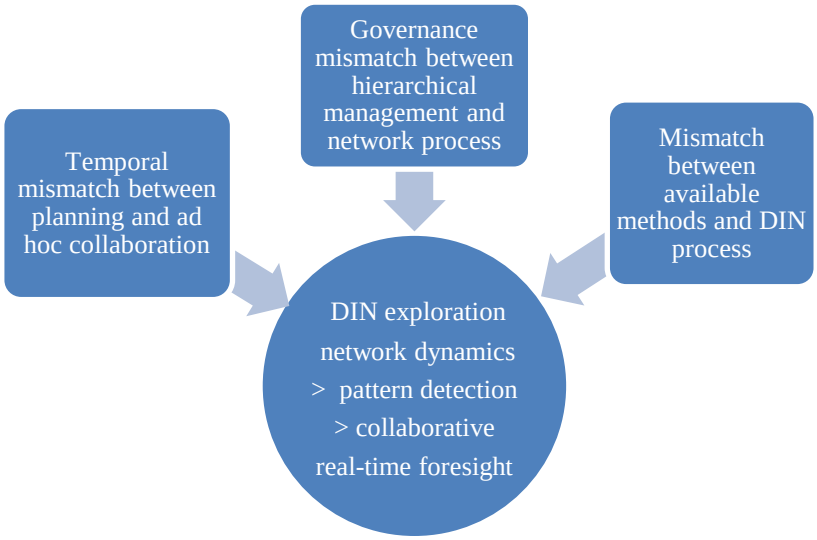

Figure 2-4: Research rationale for a new real-time foresight