Real-time foresight : preparedness for dynamic innovation networks

Weber, C.R.M.

1 The challenge of managing real-time collaboration

In our ‘global age’ (cf. Albrow, 1996, 2014), many governmental and industrial actors are facing rising uncertainty, increasing complexity, and a degree of acceleration that portends disruptive change. Lost in ‘big data’ and in inconsistent information, actors tend to withhold decision-making and to postpone cooperation in opaque situations. Frequently, actors are blocked when the clear ‘road to the future’ seems too obscure. What they need in order to move is foresight. Foresight methods prepare for uncertain futures and help us to cope with unpredictability (cf. Comfort, 2007; Cook, Inayatullah, Burgman, Sutherland, & Wintle, 2014). There are many different types of foresight (see, e.g., Georghiou, Harper, Keenan, Miles, & Popper, 2008; Kuosa, 2016) but among them, technological foresight (TF) is the most well-known. It is used by public and by private actors worldwide. To accommodate to temporal dynamics, our research will focus on *real-time foresight (RTF)*, and the thesis will guide the reader towards this new collaborative concept.

Technological foresight (TF) uses selected expert knowledge to extrapolate technological trends into different scenarios of the future (cf. Linstone, 2011). Roughly, it works as follows: after cycles of expert information gathering and collection of opinions, leadership has to make a decision and then turns to strategic management to pursue the identified goal. TF has thus become a successful means of support for decision-making under conditions of uncertainty in political and economic fields (cf. Daheim & Uerz, 2008). Actors can, however, face a misfit between the projected procedure and the more volatile societal reality (cf.

Battistella & De Toni, 2011; Könnölä, Scapolo, Desruelle, & Mu, 2011). This misfit increasingly hampers them in situations of real-time collaboration. To illustrate such situations, two example cases are given, one from a governmental realm and one from an industrial realm.

1.1 Two example cases

Real-time collaboration is difficult to start and even more difficult to continue successfully. This holds for public actors and for private actors alike. The text below provides two examples: the first concerning a tsunami and the second a disruptive market scenario. Both cases illustrate an urgent response situation, one multi-sectoral (1.1.1) and the other business related (1.1.2). In the examples, the thesis looks at collaborative leadership (1.1.3) and shows that in both cases leadership is poorly prepared. All three subsections end with a question that will guide the research.

1.1.1 *Global relief*

In a tsunami, hundreds of people are killed and their villages are washed away. TV screens and social media repeatedly show pictures and videos of multiple forms of devastation. As a global public, we have seen such disasters before (cf. Donini, 2012). We are used to the rational explanation of vulnerability, and we expect international institutions and local leadership to respond quickly and effectively. After all, information technologies (ITs) advanced so that we now receive information in real-time. Transnational aid organisations can fall back on high technology equipment (cf. Miller & Rivera, 2016). Even in the Philippines or Haiti,

both disaster prone and weak economic areas, Internet platforms and media services are accessible and the most remote villages can be reached, albeit sometimes only in principle (cf. Van Wassenhove, 2006).

Immediately after a large scale disaster, hundreds of organisations, both smaller ones and global professionals, rush in to help the affected people. Locally, however, there is an obstinate problem that needs to be overcome. The established and planned processes of experienced organisations are mired in the turmoil of mass collaboration, divergent customs and fragile state administration (cf. Kaplan, 2009). Governmental agencies and other central administrations are not able to match and manage the technological capacities of competing independent actors in real-time. In expectation of an integrated solution, actors lose precious time and information exchange remains scarce. Local and global media coverage reaches a peak and ends after a few weeks, while the local problems persist. The rehabilitation process slackens. Foreign NGOs leave or erect their own safety compounds. Locals arrange their lives in temporary shelters. In the end, too often, global relief outcomes are disappointing and leave satellites of donor dependant foreign infrastructure (see, e.g., Fazarmand, 2007; Landry, O'Connell, Tardif, & Burns, 2010). The recurring question is: (1) how can we improve the very start of real-time collaboration so that it can lead to successful long-term processes?

1.1.2 *Disruptive markets*

The second case is a market situation. A company has to restructure its core business. Many decisions are pending, many agents are waiting, and there is a need for immediate communication and crisis management. Clients, suppliers and customers hear suspicious rumours from many sides. The leadership has to step into parallel response activities without

a concrete new goal. There is an increased need for partnerships that add new assets to the former business. However, the company is not ready to cater for such assets by itself (cf. Prahalad & Krishnan, 2008; Schaltegger & Wagner, 2011). A collaboration with new partners for radical innovative products or services provides possibilities to regain a position in the fast changing market (cf. Block, Thurik, & Zhou, 2013). Here, the problems are (a) how to find the *right* partners, and (b) how to create an enduring collaboration in a regional or global innovation network (Barnard & Chaminade, 2011b) which will weather the disturbances of the business environment. The repeated question in both fields is: (2) how can we optimise collaborations for success in a dynamic and unpredictable process?

1.1.3 *Leadership is poorly prepared*

Both cases confront the actors with unexpected and unintended changes in real-time. Critical incidents induce unpredictable developments (cf. Weick & Sutcliffe, 2007) and precipitate unfamiliar multi-stakeholder situations (cf. Parmar et al., 2010). An approach to heterogeneous actors, even from different sectors, seems necessary, but even more necessary is a burst into immediate action. Of course, in both cases, such collaboration is not intended and planned for, initial goals are lacking and most information remains confusing. Established management routines of the leadership creak in such circumstances, and challenged actors stumble in many societal fields: from education to health care, and from academic fields to sports, what ad hoc collaboration really needs *at this stage* is new procedures that support management, without central decision-making, yet, leadership has no management concepts to hand. Organisational management still means executing a process of linear control

with key performance indicators (KPIs) and stage-gate models (cf. Greenberg, 2013). Obviously, leadership is poorly prepared to manage dynamic and open collaboration. The question therefore is: (3) how can we compose collaborative modes of management to execute successful real-time processes?

1.2 Thesis motivation

The three questions above are no longer peculiar to highly reliable organisations (HROs) such as fire brigades (Weick & Sutcliffe, 2007), and have to be recognised as direct consequences of technological development. Globally, technology enters all human places, from city markets to the human body. So, my motivation is the fact that we have begun to live in digital societies. Global markets and real-time data erode the former boundaries of time and space (cf. Katzy, Bondar, & Mason, 2012) in established institutions and accelerate our communication. Therefore, we need to invent and use more collaborative management methods and infrastructures to keep pace with the complexity and volatility of our societal reality.

As the principle of 'normal accidents' (Perrow, 2007) is innate to complex organisations but not sufficiently embedded in technological practices, organisational management needs new strategies and foresight tools for rapid response and for dynamic long-term collaboration (cf. Kuosa, 2016). My limited personal experiences in global relief have only confirmed what the literature suggests (see, e.g., Schulz, 2009; Graham, 2010): real-time collaboration fails at least as often as it leads to success.

So, many organisational actors in disaster management avoid collaboration in the face of multiple uncertainties, but as a consequence, they avoid innovation processes that would quite adequately answer the rising challenge of accelerated unpredictability.

The research interest here is certainly not limited to innovations in the market place. It is directed at *value creating innovation processes* of all kinds. Collaborative innovation processes are marked by uncertainty as "what is needed to perform well is unknown *a priori*, rather it is constructed over a project's course" (Deken & Lauche, 2014, p.3). Below is a short definition of innovation (Definition 1-1) for use in this study.

Definition 1-1: Innovation

Innovation is the process of putting new ideas or technologies into commercial or organisational practice (Tatnall, 2011).

Since this study's interest is in spontanously starting and cascading innovation processes it is necessary to narrow down the definition a little further. In contrast to delimited R&D in corporate departments, the innovation processes dealt with in this study are: processes that unfold in real-time collaboration under conditions of unpredictability. Moreover, they include heterogeneous actors and unknown factors. Owing to their uncontrollable and accelerated character, such innovation processes are referred to as *dynamic* (see Definition 1-2).

Definition 1-2: Dynamic innovation processes

Dynamic innovation processes are real-time collaborations by heterogeneous actors in which new ideas or technologies are put into practice (adapted from Okhuysen & Bechky, 2009).

Real-time innovation processes with unplanned starts and ends display multiple parallel and iterative ad hoc activities. The collaboration challenges the existing organisational management and the technical infrastructure. In innovation processes, unexpected incidents repeatedly interrupt the course of the expected interaction (cf. Van de Ven, Polley, Garud, & Venkataraman, 1999). This thesis will investigate in which ways the existing management concepts are inconsistent with a dynamic network method of governance. In addition, it will examine the patterns of successful collaboration in volatile processes. The thesis is motivated by the aim of better understanding and changing the misfit between individual and central actor approaches toward inherently networked solutions. In response to pressing and "wicked problems" (cf. Peterson, 2009), this research proposes a form of *real-time foresight* which will better prepare individual actors for the management of network dynamics.

Scientifically, the author is inspired by research in two specific domains of social science: research into collaborative action (cf. Arendt, 2013) and co-production (see, e.g., Ostrom, 2010; Sennett, 2012); and research into fast and slow modes of thinking (Scarry, 2012; Shleifer, 2012) and foresight (see, e.g., Van der Helm, 2007; Kuosa, 2016). The research domains overlap in the emergence of dynamic innovation networks.

The author's research interest led her back to the *origins* of management and innovation theory. Innovation and social change initially were attributed to men of 'heroic' entrepreneurial character (cf. Schumpeter, 1934; Weber, 1992), and an understanding of researchers of such outstanding charismatic personality or 'genius' was considered sufficient. Later, the lens of technology management and innovation theory has

shifted from the 'individual' to a plurality of innovation actors. Scholars have adopted a "new innovation paradigm" (Baldwin & von Hippel, 2011), discovering open innovation (Chesbrough, 2003; Ries, 2011), innovation networks and cluster approaches (e.g., Powell, White, Koput, & Owen-Smith, 2005). Following the demise of the powerful individual, the second traditional management attribute - the 'rational' – also began to falter, as seen in the more recent academic literature. Strategic management in traditions of economic behaviourism (Sen, 1977) and rational choice is confronted by questions of contingency and serendipity (cf. Read, Sarasvathy, Dew, Wiltbank, & Ohlsson, 2010; Harmeling, 2011). In the literature, the 'effects' of deliberate action are seen as ambiguous in studies that deal with actor-network theory (ANT), the effectuation approach (Sarasvathy & Venkataraman, 2011) and information systems research (cf. Tatnall, 2011; Gregory & Muntermann, 2014). Producing and selecting the multiple effects of an action can thus be described as an entrepreneurial and effective approach towards uncertain futures, strikingly explained by effectuation pioneers (Sarasvathy, 2001) in innovation management.

Although rational choice and linear progress have recently been contested, so far, no new *methods* have been developed to redefine strategic management for innovative co-production (see, e.g., Gloor, 2005; Blomqvist & Levy, 2006; Weber, Sailer, Holzmann, & Katzy, 2014) or collective management (see, e.g., Kaplan, 2009; Ostrom, 2010); especially not for *real-time* processes (see Weigand, Flanagan, Dye, & Jones, 2014).

1.3 Foresight *or* ad hoc management?

Why do classic foresight methods misfire in uncertain and suddenly 'open' collaboration settings? After all, it is their merit to induce the perspective on different futures; and the long-term perspective is what management needs for successful innovation collaborations. Whatever the case, there is no fit with dynamic and networked situations.

Considering a broadening scope from forecasts to foresight, and to future studies, foresight is a 'medium range' method. It encompasses both, actor and process. It is "a process by which one comes to a fuller understanding of forces shaping the long-term future" (Coates, 1985, p.343) and it provides "at least in principle, a systematic mechanism for coping with complexity" (cf. Martin & Johnston, 1999; Butter, Brandes, Keenan, & Popper, 2008). After three generations of foresight research (cf. Coates, Durance, & Godet, 2010; Linstone, 2011) the method is in fact established in literature and practice, in the policies of industrialised and of developing countries. This research will focus on technological foresight (TF) as explained in definition 1-3.

Definition 1-3: Technological foresight

Technological foresight is a 'future looking method' to reduce uncertainty and to support management in planning and decision making. Technological trends are extrapolated into different futures (scenarios) in terms of their respective resource allocations (Miles, 2010).

Three attributes of hierarchical governance hamper the use of technological foresight in real-time mass collaboration. Foresight methods are

based: (1) on central decision making, (2) on time consuming, iterative planning cycles, and (3) on technical expert knowledge at the expense of local knowledge. In a so-called "fourth research era into foresight" (Linstone, 2011), new research progresses from hierarchic to networked procedures (Koschatzky, 2005; Nelson, 2010; Linstone, 2011; Tuomi, 2012; Cook et al., 2014; Heger & Boman, 2014; Weber, Sailer, & Katzy, 2015). More recent studies have incorporated improvisation and ad hoc collaboration into the method (Cunha, Clegg, & Kamoche, 2012). The driver is that foresight methods need to fit a globally networked, digital and fast changing planning environment.

The intriguing question is: are there disciplines that already offer contributions to such a "foresight 2.0" for successful process management of ad hoc collaboration? So far, this has not been the case. In innovation management, process studies result in publications that "investigate antecedents and consequences of collaboration processes instead of their dynamics*"* (Poole, Dooley, Holmes, & Van de Ven, 2000). Potentially, a collective action which is seen as a formal behaviourist approach allows for simulation of complex interactions, but it offers a forecast instead of real-world evidence of successful dynamic management. Formal research relies on laboratory environments and yet results in "equations that are not transferable into practice" (e.g., Langley, Smallman, Tsoukas, & Van de Ven, 2013). In order to instruct managerial practice, it is necessary for engaged scholarship approaches to combine empirical evidence and exploration of *how* dynamic processes unfold and are governed successfully (cf. Langley, 1999; Van de Ven, 2007; Slotte-Kock & Coviello, 2010). Empirical evidence is gained from natural settings.

A highly dynamic and therefore very instructive setting for collaborative innovation processes is transnational relief. Global disaster management offers textbook examples of multi-actor collaboration in conditions of great uncertainty. The typical partners in such ad hoc collaboration are as varied as it is possible to be, including: vulnerable local communities, local governments, supranational institutions, foreign state actors, humanitarian aid organisations, private companies and private donors. As repeated by observers, actors and crisis researchers (Quarantelli, 2006; Comfort, 2007; Nadarajah, 2011), first and foremost, cooperation in the field needs to be improved. Although we know that sustainable disaster management is more a process than an event (cf. Quarantelli, 1988), the initial stage of crisis management still dominates the media and the academic world. Yet, it takes years to complete a full crisis management cycle: from first response, through recovery, to disaster preparedness and mitigation (UNISDR, 2009). The effectiveness, innovativeness and sustainability of response depend less on heroic emergency aid than on the collaborative management capabilities of very different actors over time (see, e.g., Donini, 2012; Wamsler & Brink, 2014).

For actors, the challenge of managing transnational relief involves coping with high levels of uncertainty (see, e.g., Bankoff, Frerks, & Hilhorst, 2004; Weick & Sutcliffe, 2007; Kilby, 2008), beginning with a massive influx of new actors on a devastated local site. The allocation of global and local resources during the process is unclear, and so is the future of the destroyed region. NGOs and state actors in the strategic planning phase find themselves in competition for resources, visibility and accountability (cf. Twigg & Steiner, 2002). Successful outcomes for

global relief cannot be expected without better understanding of the chaotic initial management situation and the dynamics which unfold between global (donors) and local levels (vulnerable regions).

According to multiple studies (including data from the present thesis) on public administration, private actors and international institutions, most actors in the dynamic relief process

(1) focus on short-term efficiency instead of long-term sustainability (cf. Boin, 2009; Kapucu, Arslan, & Collins, 2010; Turoff, Plotnick, Banuls, Hiltz, & Ramirez, 2015);

(2) underestimate the role of non-human artefacts (infrastructure and routines) in relief that considerably influence dynamic processes (cf. Latour, 1991; Kilduff, Crossland, & Tsai, 2008; Donini, 2012);

(3) are unable to identify emerging dynamic innovation networks during mass collaboration (cf. Wachtendorf, 2004; Quarantelli, 2006);

(4) misunderstand their own part in non-sustainable processes, because of low institutional learning and competition on competences (cf. Beamon, Balcik, Krejci, Miramatsu, & Ramirez, 2008).

Reconstruction and recovery are an ideal setting for innovation, as something old has to be replaced by something new. The opportunity for innovative restoration of afflicted communities, however, is all too often neglected (Boston, 2014). Without proper foresight, too few post-disaster actors recognise sustainable innovation processes. Thus, too few transform a collaborative global response into local sustainable recovery outcomes.

The notion of ‘preparedness’ which connects the beginning and the end of crisis management, in the literature more than in practice, involves

an ‘incognito’ foresight dimension. Inspired by this reference to a (better) future that is always made by us, we see global-local disaster management as an innovative field and instructive setting for the challenge of successful ad hoc collaboration and entrepreneurial foresight.

1.4 Problem statement

To formulate a proper problem statement, we resume the leading thoughts. The challenge of responding to unexpected events and of collaboration in the face of an unpredictable future inhibits actors, so public and corporate agencies have established foresight processes in order to cope with such uncertainty. However, in numerous societal realms and in an increasing number of management situations, central actor perspectives no longer apply. Planning periods and hierarchic decision-making are contradictory to the dynamic plurality of a digital age: what currently happens is that multiple actors are confronted with complex ad hoc processes. For new collaborative management teams, there are neither management styles nor real-time feedback tools available, and both are needed by the actors that have to manage real-time dynamics successfully.

This gap is addressed in the present study. The thesis takes turbulent post-disaster and global-local relief as an exemplary setting of dynamic innovation collaboration, using the opportunity to learn from best practice. The aim is to select cases of collaborative recovery by innovation networks, and from these to gain knowledge about the network patterns of dynamic innovation processes. Pattern knowledge and recognition can prepare actors for situations of collaboration in real-time. Dynamic network patterns can be used to gain a new mode of “foresight 2.0”.

Therefore, the problem statement (PS) of the thesis is as follows.

PS: How is it possible to collaborate for successful dynamic innovation processes?

The problem statement is complex since we have, (1) to investigate a variety of possible collaborations, (2) to determine criteria for the notion of success, and (3) to define dynamic innovation processes.

Item (3) has been settled by definition 1-2. For a proper understanding of the PS, it is necessary to define more precisely what is understood by successful collaboration. Collaboration is a term that applies to increased interaction, as opposed to the coordination and cooperation of actors (cf. Lindblom, 1979; Turoff, Hiltz, Bañuls, & Van Den Eede, 2013). Collaboration includes use of digital infrastructures and crosses organisational boundaries spanning bilateral partnerships to cross-sector activities (cf. Vangen, Hayes, & Cornforth, 2015). Based on the entrepreneurial foundation developed above, it is possible to speak of successful collaboration as outlined in definition 1-4.

Definition 1-4: Successful collaboration

Successful collaboration means a mutual interaction process between several actors over time leading to ends that satisfy these actors by creating value for them and/or their ecosystem. The emergence of dynamic innovation networks (DINs) is an indicator of successful collaboration.

Built on this shared understanding are five research objectives and five research questions (RQs). These address different aspects of the complex problem statement and guide the research carried out in this thesis.

1.5 Research objectives and questions

This section specifies the five research objectives. They guide the research conducted and can be considered as milestones of the study. The research objectives are to be seen as five distinct aims.

(1) To show why traditional management theory hinders ad hoc collaboration.

(2) To design a time-sensitive method to explore non-linear innovation processes.

(3) To analyse dynamic innovation processes in a network perspective.

(4) To identify the innovation strategies of various relief DINs.

(5) To develop a new real-time foresight and real-time evaluation tools.

These research objectives lead to five guiding research questions. The first RQ relates to the conceptual background and reads as follows. **RQ 1: Why do strategic management and foresight fail in ad hoc collaboration?**

This research question is addressed through a focused literature review (Chapter 2). The traditions of strategic management (cf. Martinet, 2010), collective action (see, e.g., Van de Ven & Hargrave, 2006) and foresight (cf. Nelson, 2010) imply hierarchical structures. It is essential to investigate why this is problematic for real-time collaboration and to identify in exactly which points. The thesis seeks to identify the concrete parameters in which a managerial turnaround is required.

Moreover, the study examines wether lateral, non-hierarchic governance is already described in the network literature, especially - on *innovation* networks. The topic is already spearheaded in recent management

literature, for example, in entrepreneurship research (cf. Pittaway, Robertson, Munir, Denyer, & Neely, 2004; Graf, 2006; Schaltegger & Wagner, 2011) and disaster management (cf. Kilby, 2008; Kapucu et al., 2010), but so far, network emergence and network governance remain puzzling to strategic management and public administration (cf. Meier & O'Toole, 2005). To improve the management of unexpected real-time collaboration, the evolution of networks and emergence of *dynamic governance structures* have to be understood.

Many dynamic innovation processes are connected with each other. This implies that they form a network. Global innovation networks (GINs) are discussed in parts of the entrepreneurship literature (see, e.g., Ernst, 2002; Sazali, Haslinda, Jegak, & Raduan, 2009; Barnard & Chaminade, 2011a) and variously defined in disaster management (see Varda, Forgette, Banks, & Contractor, 2009; Kapucu, 2015). This study adapts one such basic definition in order to examine the PS. Therefore, it frequently refers to dynamic innovation networks (DINs). The concept is defined in definition 1-5.

Definition 1-5: Dynamic innovation network

A dynamic innovation network (DIN) emerges from the interconnected and integrating practices of actors that engage in innovation activities (adapted from Barnard & Chaminade, 2011b).

DINs comprise heterogeneous regional or global actors including companies and non-firm agencies, human and non-human elements. To answer RQ 1 it can be seen that empirical knowledge must be gathered about *how* networks emerge in real-time and *how* collaboration in DINs

unfolds over time. So far, empirical findings are lacking and publications are scarce. Therefore, the study aims to explore the dynamic network evolution, and consequently, RQ 2 is about how to investigate network emergence and evolution in a natural setting.

RQ 2: How is it possible to adequately explore successful ad hoc collaboration in dynamic innovation networks?

Global relief is the chosen exemplary setting for exploring innovation collaboration in the making. In the chaotic post-disaster period, multiple actors join and perform relief activities, but only successful collaboration processes generate local sustainable outcomes. Long-term reconstruction is a non-linear, and in the best of all cases, innovative process. Yet, until now, its governance has escaped the notice of the actors and the standard ex-post evaluation. We have learned from two research mistakes in recent crisis management studies that it is not sufficient when evaluating the outcomes or the plans of implemented measures: (1) to look at only one organisational actor (cf. Lalonde, 2011; Dorasamy, Raman, & Kaliannan, 2013), and (2) to look at only identical organisational actors (cf. Comfort, Ko, & Zagorecki, 2004; Schoenharl, Madey, Szabó, & Barabási, 2006; Schulz, 2009; Hermann et al., 2012; Kapucu, 2015).

To explore successful collaborative dynamics and to detect *emerging network patterns*, the heterogeneous network level has to become a unit of observation, and it has to be observed over time and disruptive evolutions. The reason is straightforward. In mutual interaction between heterogeneous actors only, complex entrepreneurial processes unfold and show their idiosyncratic intricacies (cf. Caliendo, Fossen, & Kritikos, 2012).

For a proper understanding of non-linear and disruptive collaboration over time, this thesis adopts the critical incident technique (CIT) as a method of observation. It relies on Flanagan's definition of a CI as given in definition 1-6.

Definition 1-6: Critical incident

A critical incident (CI) is an event that changes the ongoing activities or project plans (adapted from Flanagan, 1954).

CIs may have positive or negative effects for different actors in a dynamic innovation process. Heterogeneous actors, innovation networks and CIs are the conceptual parts of the research design that the thesis develops in answer to RQ 2.

We are now ready to focus on RQ 3 that reads as follows.

RQ 3: Which network patterns facilitate real-time innovation processes?

In social network analysis (SNA), networks are first and foremost described as structures. These structures, though, have a potential to change over time. By taking changes into account, static network models could take a dynamic turn, but most studies still are based on homogeneous ties and nodes. SNA neither accounts for actors' heterogeneity in complex collaboration, nor for unfolding disruptive changes in a dynamic real-time process. Therefore, only a few insights can be obtained for *leadership* in real-time collaborative innovation processes.

Thus, to advance network models to an inclusion of heterogeneous actor's perspectives and to ad hoc collaboration facilitation over time, it

is necessary to use an actor-network lens. The dynamic network perspective (see Chapter 2) is chosen to explore the practices, interests and collaborative network patterns of different socio-technical actors. Actor-network theory (ANT) talks of network-actors and actor-networks, to emphasise their original conglomeration.

According to the actor-network theory (ANT) literature, the relationship between network and actor is defined as follows.

Definition 1-7: Actor-network

An actor-network emerges from the heterogeneous *interests of socio-technical actors*. It evolves as a hybrid of human and non-human actors in a so-called *translation process* of interests (adapted from Latour, 1999).

This study argues that a constructivist ANT does not start from isolated agents that deliberately relate to others. Therefore, social practices are followed and observed in perspectives of heterogeneous, hybrid network-actors. These socio-technical actors are retraceable as they are involved in the translation processes of an emerging network, as defined in definition 1-8.

Definition 1-8: Network-actor

A network-actor is an "element which bends space around itself, makes other elements depend upon itself and translates their will into a language of its own" (Callon & Latour, 1981:286).

RQ 4 steps consciously from the abstract level into the practice of network management in the field of disaster relief. The aim here is to find out how a strategy emerges from collaboration. It will be interesting and important to discover whether DINs use the same innovation strategy in successful real-time collaboration. If not, then it will be relevant (for science and for practice) to explore how the available network patterns lead to different strategies, and to ask which major dimensions influence and shape the emergence of different DIN strategies. RQ 4 is formulated to investigate such questions.

RQ 4: Which innovation strategies are used by DINs in global relief?

One of the dynamic patterns identified by this study's process analysis is the double-sided network-function of focal actors for (a) network governance and (b) local sustainable impact. In post-disaster settings, local NGOs (LNGOs) are such focal actors which initiate the ad hoc process and stay to the end. The DINs in the study sample revolve and build strategies around their profiles. A focal actor role is defined according to ANT in definition 1-9.

Definition 1-9: Focal actor

A focal actor is a network-actor which aligns the heterogeneous interests of the other actors (Tatnall, 2011).

A classic multisided notion of strategy (Mintzberg, 1987) includes two dimensions: a deliberate part (plan) and an emergent part (pattern). For both strategic dimensions, this thesis selects relevant management codes from its codebook (see Appendix D). Finally, it will explore, with both

kinds of codes, the differences between network strategies, CIs and focal actors.

In asymmetric and multivalent partnerships (cf. Ekbia & Kling, 2005), the typical shape of DINs in global relief, resources and management capacities, information, technical and local knowledge are unequally distributed. The dynamics between small local and professional global actors are decisive in sustainable relief (cf. McGilvray & Gamburd, 2010). The network strategies employed by LNGO actors in this study's sample reveal polar profiles, although which dimensions of those profiles are generally so significant that they are relevant to the matching processes which take place is not clear. This research sets out to determine the most adverse collaboration dimensions.

As a sequel to RQ 3 and RQ 4, the last RQ turns away from leadership practices in global relief and back towards the generic research interest: the challenge of ad hoc collaboration, management and foresight for dynamic innovation processes.

RQ 5: How should a well-qualified management team plan and manage dynamic innovation processes?

The last research question aims to develop a new managerial method that uses real-time concepts and digital infrastructure to direct attention towards network emergence. The underlying question is whether such a new style is designable and controllable. To investigate this question, the study splits the search for an answer into two parts. First, it designs a new real-time foresight version, and second, aims to make it measurable by adding process evaluation tools to identify and measure the collaborative performance of DINs.

The next section describes the methodologies employed to achieve each of the research objectives and answer the five RQs.

1.6 Research methodologies

For social research that aims to generate new knowledge on little known phenomena, an explorative approach and qualitative research methods are best (cf. Crabtree & Miller, 1999; Creswell, 2013). Management scholars recommend a pragmatic process (cf. Onwuegbuzie & Leech, 2005) and a combination of different methods. With this in mind, this study was designed to find the best fit between (a) research question, (b) research context, and (c) research methods (cf. Edmondson & McManus, 2007).

The proccessual qualitative study in hand is based on grounded theory methods, or GTM (Strauss & Corbin, 1998; Bryant & Charmaz, 2007). It explores a dynamic, non-linear collaboration process (Pettigrew, 1997) in a dynamic network framework. To compare and confirm successful DIN patterns, a cross-case comparison (see Eisenhardt, 1989; Yin, 2009) was conducted. Grounded in narrative interviews and on rich secondary data, *codes and categories* for network-actors, CI and network dynamics were assigned. The comparison of CIs and the other significant categories was achieved by coding and further analytical procedures conducted using the software ATLAS.ti.

The research is based on three principles that are criteria of solid GTM studies (Peters, 2014): (1) careful 'theoretic sampling', (2) deep grounding of concepts and categories in codes and *data*, and (3) hand-in-hand advancement of data *collection* and data *analysis*. The thesis abides by all of them. To achieve the research objectives (see Section 1.5) it

addresses the five RQs derived from the PS by following the five methodologies:

(1) Literature review (focused on management approaches, see Chapter 2)
(2) Conceptualisation (for research design and CIT, see Chapter 3)
(3) Analysis and coding (in ATLAS.ti, see Chapter 4)
(4) Cross-case comparison and central code operationalisation (see Chapter 5)
(5) Transformation of patterns and operationalisation (see Chapter 6)

1.7 Structure of the thesis

The thesis contains seven chapters which guide the reader from a theoretical appreciation into a larger empirical section.

Figure 1-1 depicts the sequence of the chapters and the structure of the study. Each chapter finishes with a chapter summary which is short and index oriented.

Chapter 1 introduces the problem of real-time collaboration and explains the motivation behind this research. The research topic is embedded in the empirical field of disaster management. The PS is discussed and divided into five RQs that are addressed by distinct thesis chapters. The main theoretical constructs are defined and the methodologies to address the research questions are listed. The chapter ends with a table that shows which chapter addresses which RQs.

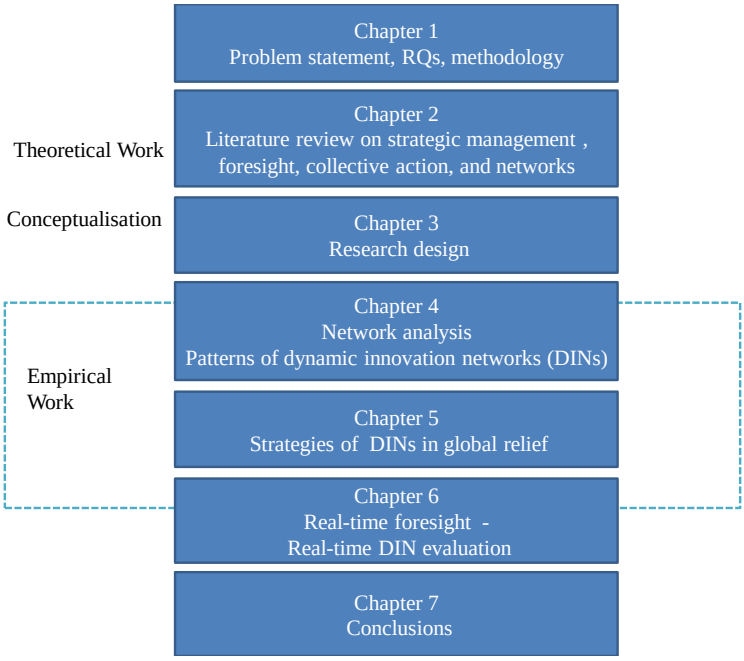

Figure 1-1: Structure of the thesis

Chapter 2 establishes a theoretical framework for ad hoc collaboration. The chapter contains a focused literature review on theoretical traditions of strategic management, collective action and foresight. The theoretical traditions cause problems for successful real-time collaboration. The chapter addresses RQ 1 and ends by establishing the research rationale, which is to understand successful ad hoc collaboration and to explore the patterns of dynamic innovation networks.

Chapter 3 constructs a research design that fills the identified research gap concerning successful real-time collaboration. It shows how

to explore the management of dynamic innovation networks and so addresses RQ 2. The answer consists in a method mix designed to retrace the evolution of non-linear processes, adding concrete time-stamps (CIT) to abstract network formation steps of ANT. Naturally, chapter 3 describes sampling, data collection and data analysis in a context of global relief dynamic innovation processes. It ends with a methodological rigour check.

Chapter 4 is the beginning of the empirical part of the thesis. It presents an actor-network analysis. RQ 3 is addressed by the stepwise reconstruction of network emergence, first by analysis of mobilised actors and CI occurrence, then by collaborative management and unfolding dynamics. Patterns that facilitate innovative collaboration within one network are identified and confirmed by the other success cases. Chapter 4 starts by presenting three global-local relief processes; it ends with cross-case evidence on five dynamic innovation patterns.

Chapter 5 aims to identify innovation strategies, so, it deals with the impact of the identified dynamic network patterns in the empirical field. The chapter searches for managerial answers to RQ 4: which innovation strategies were used by different NGO networks in relief? From a comparison of network strategies around a focal actor, the other actors enroled, and CIs, three different network strategies become visible. It turns out that ‘media alertness’ and ‘readiness to scale up’ are polar LNGO dimensions that matter for network management. In a matrix form, the finding becomes a tool that helps the user to adopt appropriate actions in asymmetric partnerships.

Chapter 6 aims to answer RQ 5 on how well-qualified management teams should plan and manage dynamic innovation processes. Based on the results obtained by the process analysis, the answer consists of two elements for real-time foresight, one to prepare for ad hoc collaboration and one for measuring real-time network emergence. To give this answer, the study proposes a new foresight method and discusses its incorporation in public and corporate practices. Thereafter, an indicator tool for real-time evaluation of DINs is derived and spelled out for both business incubation and disaster management settings.

Chapter 7 answers the PS. It considers the merits and limitations of the study. Theoretical and practical impacts are reviewed and suggestions for future research projects are given. This empirical study is positioned in the interdisciplinary field of disaster management, and its results open up new prospects for numerous academic disciplines. Testing and validation of the five dynamic innovation patterns needs further research engagement. In addition, the findings on CIs in global-local relief offer promising new material for disaster research and successful reconstruction processes. The innovative potential of reconstruction processes was, for a long time, neglected. In the light of the results, it should no longer remain unrelated to research on sustainable entrepreneurship.

Table 1-1 illustrates the order of the thesis chapters. The flow of the RQs provides a clear reading and also allows the reader to go directly to those chapters which interest them most.

Table 1-1: Overview of addressed RQs and thesis chapters

	Ch 1	**Ch 2**	**Ch 3**	**Ch 4**	**Ch 5**	**Ch 6**	**Ch 7**
PS	X	X	X	X	X	X	X
RQ 1	X	X					X
RQ 2	X		X				X
RQ 3	X			X			X
RQ 4	X				X		X
RQ 5	X					X	X