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## Co-evolution of goals and partnerships in collaborative innovation processes

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**Abstract:** This paper treats handling uncertainty in goal setting in collaborative innovation. In successive case studies, we investigate unfolding network dynamics in social and technical innovation. From process analysis of sustainable disaster management, we zoom in to beginnings of innovation processes in automotive industry. Finding similar pattern allows insights into initial collaboration dynamics. A switch away from traditional goal targeting seems necessary for effective management of uncertainty. The studies implicate that in successful mass collaboration (a) ultimate *goal setting* does not happen before, but becomes a recurring task along the process (b) *goal finding* rather means to develop a shared vision from the start (c) *matchmaking* is a decisive process in itself that overlaps partly with collaboration but starts before and probably outside. Co-evolution of goals and partnerships means management has to back out of strict control in mass innovation and process dynamics need careful attention from the beginning.

**Keywords:** Collaborative innovation process, goal uncertainty, network dynamics, matchmaking, shared vision, technological and social innovation

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## 1 Introduction

Innovation is change that outperforms a previous practice or creates something completely new. While an innovation in our digital economies and societies appears as surprising new product, new service or new organizational format, the process behind and before is less visible. Yet, mass collaborative processes and how they lead to sustainable innovations attract more and more attention from different sides.

Our paper contributes to deepen the understanding of collaborative processes where it is not possible to target a fixed goal. In this, being part of an innovation network, put in a metaphor, is similar to being wintered on a mountain trail. It means to back down from a foggy and dangerous peak to a new and unknown valley, passing nameless environments and unfamiliar situations with foreign partners that speak different languages.

Societal challenges find their academic expression in rising numbers of studies and conferences on sustainability to enhance innovations for sustainable futures. But studies combining fields of social and technological innovation still are rare (Van den Ven & Hargrave, 2006). Complex collaborative innovation and how to cope with *uncertainty* is the essential challenge for both fields. In collaborative innovation processes, actors face uncertainty in many dimensions: Goal uncertainty (Tomsic & Suthers, 2006), matching and process uncertainty (Katzy, Turgut, Holzmann, & Sailer, 2013), demand and resource uncertainty (Mizruchi & Stearns, 2001).

Yet, all uncertainty in complex collaboration seems not to hinder success: Regional settings of Biotech clusters (Powell, Koput, & Smith-Doerr, 1996), crowd-sourcing platforms or IT public private partnerships create high outputs in technological innovations. New economic priorities of digital societies like “Sharing Economy” and “New Ways of Work” (Katzy, Bondar, & Mason, 2012) make markets and social life much more dynamic, more selective and again, less controllable. Ubiquitous and auspicious, collaborative innovation takes hold but has a dark side, too: It also often leads to disappointed expectations, suboptimal outcomes (Tallqvist, 2009) and pullout of partnerships instead of fabricating successful outputs in the short run. This is the case in both social and technological innovation (Zahn, Kapmeier, & Tilebein, 2006). How do the more successful cope with uncertainty? To tackle the problem, it has a potential to use examples of successful collaboration from both realms to illuminate long term and short term process dynamics.

Societal change is driven by contingent innovation processes that have long term impacts but sometimes radical origins. An illustrative example of collaboration of multiple actors and technologies (Latour, 1991; Powell, White, Koput, & Owen-Smith, 2005) where networks emerge rapidly and create innovative outcomes over time is global disaster management (Wachtendorf, 2004) or asymmetric partnerships between start-ups and established firms (Rothaermel, 2002). With regards to sustainability, in disaster management among multiple actors, the local organizations are the ones to stay - but rarely the ones to set goals initially. In rehabilitation, new structures, materials and ideas are used to rebuild villages, cities and regions, a mass of opportunities exist and multiple actors are forced to collaborate, pool resources and mix local and global standards: It is obvious that we can observe innovation processes of global shape in such cases. From first response to end of reconstruction often periods of 10 years and more can be traced, which allows to measure sustainability of innovative project impacts.

In undertaking this effort, empiric evidence from different successful relief networks showed that while many critical incidents influence ongoing disaster management year after year, most critical events for sustainable outcomes of collaboration happen in initial stages (Weber, Sailer, & Katzy, 2012). It turned out to be interesting therefore to investigate this dynamic in an ongoing collaboration process, allowing to zoom in and to better understand important steps of partner finding under goal uncertainty. Thus, we got involved in emerging innovation and matchmaking processes in an industrial automotive setting, where established companies and start-ups are interested to collaborate for radical innovation towards sustainable and emission reduced mobility.

It turns out that for both collaborative processes, innovative outcomes do not depend on initial goal setting and efficient target tracking. Instead a co-evolution of many stopovers, goals and partnerships yields to successful, sustainable outcomes. It does so if partner's interests and strategies are early aligned in a shared vision which enables individual activities under a common flag. All depends on creating a vision that is precise and flexible enough to release action and establish bonding: In one case, it is the promise to care for 100 children at least for 10 years, and in another, the claim to bring 1 million electronic vehicles on the road in 2020.

The paper presents in the next chapter traditional models of innovation management, adds literature on formation of collaboration and tries to connect both for collaborative innovation processes. The still missing explanation for handling goal uncertainty heads us in chapter 3 into process analysis in two settings with six case studies which are setup one based on the other. Discussing of our findings brings us back to theoretic implications and contributes new perspectives to collaborative innovation. Concluding, we derive suggestions for effective management of mass innovation for more sustainable and inclusive societies.

## **2 Literature Review**

The collaborative innovation process is dynamic, time flowing and often inscrutable and incalculable. In new situations - well known by start-ups - it is often not possible to identify a clear collaboration goal or to know the right partners despite strong interest to find ones (Blank & Dorf, 2012). All actors, however, need to plan before investing scarce time, lots of efforts and precious resources in an unforeseeable collaboration process. To manage innovations, companies as well as non-profit organizations are used to plan with targets, in timeframes and by sanctioned budgets, just as for daily and routine operations (Powell et al., 1996; Tallqvist, 2009; Tomasini & Van Wassenhove, 2009; Waugh & Streib, 2006).

Literature on innovation processes suggests different realms and orientations for social entrepreneurship on the one hand and industrial or technological on the other (Cajaiba-Santana, 2014; Carvalho, Fleury, & Lopes, 2013; Mulgan, 2006; Van den Ven & Hargrave, 2006). This division no longer holds as a matter of course (Fuller & Tian, 2006), but so far, little empirical evidence to interlink the fields is available as studies rarely integrate data from both settings (Van den Ven & Hargrave, 2006).

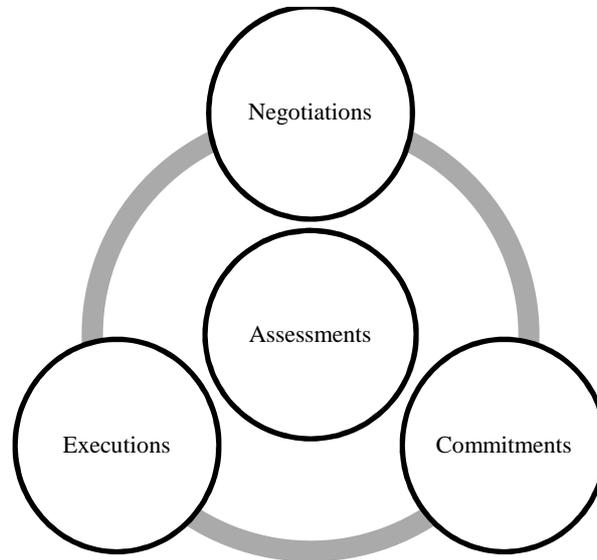
Especially in R&D management, the innovation process is seen as sequential steps in linear order. For example, the stage-gate process (Cooper, 1990) is such a structured manageable approach for innovation in corporations. Its core idea is that an innovation is formed across several stages and is only transferred to next maturity stages when a control gate is successfully passed. This is similar to quality management, where concrete key performance indicators (KPI) for monitoring existing routines are defined (Deming, 1986). Open innovation represents a new generation of more complex and integrated innovation processes (Chesbrough, 2003; Ortt & Smits, 2006).

If we look into the different setting of disaster management, organizational planning in international relief programmes looks very much the same. To get support from public or private donor institutions, NGOs apply for and implement projects that outline sequential stages: Emergency assistance, livelihood restoration, rehabilitation, and - if clinging to sustainability - reconstruction with preparedness and risk reduction (Landry, O'Connell, Tardif, & Burns, 2010). But goal uncertainty and high time pressure are unavoidable characteristics of disaster management, and stepwise efficiency maximizing planning often adds to separated interventions and less sustainable outcomes. In the aftermath, missing links of relief and reconstruction are deplored (Birkmann, 2005; Satterthwaite, 2010).

Similar problems arise in transitional industrial change like in the German automotive industry. Electro-vehicles are expected to create sustainable mobility impacting other industrial sectors as electricity, telecommunication or services like car sharing. In transitional phases, entrepreneurial start-ups can bring radical change or create new markets outdating established business models, but they often lack resources and market know-how (Minshall, Mortara, Elia, & Probert, 2008). Problems of the stage-gate model in innovation management arise not only in the “fuzzy front end” – regarding outcomes, long term impact on other sectors or sustainability, it also does not explain managing collaboration. This management model remains helpless in situations of complexity, volatility and uncertainty. More inclusive innovation process approaches (Berkhout, Hartmann, Van Der Duin, & Ortt, 2006; Cheng & Van de Ven, 1996) were developed to integrate collaboration dimensions. Describing the innovation process as a longer journey and traversing corporate perspectives, models of relationship formation (Ring & Van de Ven, 1994) are used to integrate best activities in multi stakeholder partnerships.

The collaborative process in this model is explained as “a repetitive sequence of negotiation, commitment, and execution stages, each of which is assessed in terms of efficiency and equity (Ring et al., 1994, p. 97).” In the negotiation stage, all involved actors create a common understanding about an uncertain topic by formal bargaining and informal sense making. The commitment stage is the point, where the “wills of the parties meet” (Commons, 1950) that affects the legal contract, the behavioural norms for basic collaboration and governance structures. Actor-network theory, another approach to historically investigate the formation of macro-actors, identifies very similar principles of network formation (Akrich, Callon, & Latour, 2002): To form a heterogeneous actor-network, the interests of all actors have to be aligned very early in a common “obligatory point of passage” (OPP) to guarantee alignment and mobilisation of activities in a common orientation and is thus a matter of interaction (Holzmann, Sailer, Galbraith, & Katzy, 2014). Such a point

also can be seen as initial dynamic of network formation in abstract technical terms of Actor Network Theory (ANT).



**Figure 1:** The cyclic process model of inter-organizational relationship formation (Ring & Van de Ven, 1994)

Adding partnership or network formation approaches to innovation management models, the process of collaborative innovation becomes more visible. Still, explanation for successful collaborative innovation under goal uncertainty remains an open question. It highlights assessment of effectiveness, efficacy and equity, but less is said about how to do this in processes of high velocity and uncertainty. In our study, we start from this point and try to find out how goal finding, goal setting and matchmaking; the partnership formation process itself becomes part of our investigation.

### 3 Methodology and Research Approach

In the following, we present a process analysis with in depth case studies (Eisenhardt, 1989; Yin, 2009) from different collaborative settings. One is based on the other. First, we explore collaboration in innovative relief networks after Tsunami 2004. From the findings of the retrospective long term process analysis, we turn to an action research process to explore in more detail the initial critical formation of the evolution of innovation networks. The second case study, therefore, investigates collaborative innovation in the German automotive industry.

#### 3.1 Disaster Management for sustainable long-term impact

Primary data on three inter-organizational relief networks were collected from 2011 to 2014. Semi-structured in-depth interviews with global and local Humanitarian NGO experts were conducted and triangulated with project reports and Legal Acts as well as with

newspaper clippings. Key turning points in collaborative disaster management were mapped and coded in ATLAS.ti, according to principles of Grounded Theory (Glaser & Strauss, 1967).

In 2004, a Tsunami hit Indian coastal regions and caused unprecedented losses. We investigated three cases of networked global-local relief in Tamil Nadu. The heterogeneous inter-organizational collaborations started from chaos in very similar turbulent situations providing lots of opportunities and challenges. Each network mastered challenges to find sustainable solutions in relief and reconstruction over several years.

**Table 1** Collaborative dynamics in disaster management

<i>Collaborative Dynamics</i>	<i>Case1: Paramankeni</i>	<i>Case2: Enayam</i>	<i>Case3: Velankanni</i>
Goal setting (2005-2010)	Rebuilding the village Inclusion of all religions and castes Fighting rising costs in reconstruction Fighting discrimination	Livelihood restoration Bringing fisher back to sea Skill trainings for female population Income generation Market innovation	Safe children/ Tsunami victims from risk of abuse Running school and shelter children 9-17, Rural community development Education center for backward villages
Goal finding	Local need for housing	Women need to rebuild livelihood	Donor Reluctance of short term intervention
Shared visioning	Achieving 300 houses for all castes and religions	To startup female workshop for engine repair	Children home to support 100 children over 10 years
Matchmaking	Intermediaries many donors, many partners, sector experts	Trusted partners and for profit company	Intermediary NGO prior collaboration experience multiple old and new partners over time
Collaborative strategy	Organizational Innovation and Capacity building in asymmetric partnership	Explorative innovation by network protection	Exploitative innovation & use of media and PR in communicative network

With regards to *goal setting*, different goals came up and became realized in disaster management in the different networks. Table 1 gives an overview illustrating how network- depended relief measures are. The goals defined by each network changed in dependence from local need demand and from collaborative interaction. In the beginning, it would not have been possible to name or address them in the right way.

With regards to *goal finding*, in all networks of sustainable relief, the creation of a vision from splattered communication of heterogeneous needs and interests of different partners (affected, donors, NGOs) was reported. Born from informal mass communication, it was spread by initiators and attracted partners that felt their own mission fitted to contribute. The claim found as a *shared vision* was not a goal; instead, these shared visions facilitated the formulation of goals in ongoing disaster management. In actor-network theory, a shared vision can serve as or become inscribed in boundary objects (Briers & Chua, 2001).

Finding the right partners and this shared vision belongs to the most important steps in long term disaster management. From the investigated cases, a good partner fit was facilitated by former partner experience; trust in intermediaries and early commitment to a shared vision. Partnerships and networks were often initiated before program implementation and endured after the end of disaster management.

The *collaborative strategies* of inter-organizational networks differ but are typical within inter-organizational networks after disasters. In network 1, asymmetric partnership collaboration led to organizational innovation transforming the smaller local partner. Knowledge and capacity building scaled up this NGO to an international network partner with global standards. In network 2, innovations were realized in a completely different mode. Experimental and entrepreneurial ideas were realized locally, in the protective, avoiding communication and buzz from outside, which would have put at risk the female technicians at work in this village. In network 3, again, collaborative innovation was realized by strategies of professional media involvement, advocacy experience and high global reach of the network.

In sum, where collaborative innovation in disaster management and relief was realized to sustainable ends over 10 years, it was facilitated by a co-evolution of goals and partnerships. A shared vision enabled actor-network building in the beginning, and by setting recurrently new and following goals, the partner minimized unintended effects of disaster management. But how partner matching happens in detail could not be answered from a retrospective case analysis, and so we went for action research methods for the initial stages.

### 3.2 Matchmaking for transitional change in the automotive industry

The change of the German energy policy, the so called “Energiewende” is a global prototype for sustainable energy production, distribution and consumption. In this, the vision of 1 million electronic vehicles in 2020 is claimed by the federal government. We had the opportunity to join a large automotive manufacturer in searching for innovation partners outside their core network, in order to successfully implement electronic vehicle charging infrastructure for their new e-vehicles. For that reason, an innovation intermediary was engaged to find suitable small entrepreneurial start-ups corresponding to certain requirements of the established companies’ managers.

We set up a participatory research approach (Ottosson, 2003), in order to study the emergence of innovation partnerships and gain a better understanding about managerial processes for partnership formation and matchmaking in real settings. Data were collected from January 2012 till February 2014 by conducting semi-structured interviews, meeting

minutes and field notes. Theory development followed an iterative cycle between active participation, problem solving, reflection and abstraction (Susman & Evered, 1978).

**Table 2** Collaborative dynamics in industrial management

<i>Collaborative Dynamics</i>	<i>Case 1: Successful collaboration formation for joint innovation</i>	<i>Case 2: Successful collaboration formation for technology transfer</i>	<i>Case 3: Unsuccessful collaboration formation</i>
Goal setting	Development and Implementation of public charging technology; Bilateral non-disclosure agreement; Resource commitment for collaboration; Integration in OEM's innovation network	Clear contracting with timelines and deliverables, like in classic supply chain management	Development of technology implementation roadmap; Integration of interface technology for prototype testing
Goal finding	Attraction with intelligent public charging solution Joint ideation at matching event and several follow up meetings; Suitable and complementary technology for long term strategy	Based on technological requirements stated in a catalogue (like a supplier); Technological feasibility with short term realisation goals	Attraction with open platform for public charging services; Joint ideation, prototyping and technology implementation; Several follow up meetings
(started 10/2012)	ongoing	operationalized	terminated
Shared visioning	Partnership for public charging infrastructure and operating business model was decided for 2020 vision	Partnership for building larger technology supplier diversity for existing charging infrastructure.	A shared vision started to emerge, but did not end in concrete collaborative efforts
Matchmaking (03/2012 – 02/2013)	Intermediaries coordinated the matchmaking; later the start-up became associated member in EV Charging industry consortium	Intermediaries coordinated the matchmaking; supplier contracting based on existing solutions and technology	Intermediaries coordinated the matchmaking; loose collaboration started, but terminated
Collaborative strategy	Exploration of new technological approaches and innovative open business models	Technology transfer from start-up side as supplier; established firm as resource enabler	At the beginning, exploration for technological integration

As logical consequence of building new network ties for collaborative innovation, finding the right partners and *matchmaking*, are the essential steps. We joined 12 matching events, all between managers of the established automotive firm and the potential entrepreneurial partners. In the end, two concrete collaborations were initiated, which are

studied in this paper. For better contrasting of our findings, we also present one unsuccessful case, where no matching occurred.

With regards to *goal setting*, collaborative dynamics were identified in each case. While in case 1 and 3 goals emerged and changed over time in group meetings, case 2 shows, a clear contracting with the start-up as technology supplier.

With regards to *goal finding*, we observed different dynamics based on short and long term goals. Especially for long term collaboration, a shared vision turned out to be essential for successful collaboration. While in case 1 a shared vision emerged during interaction of goal finding and goal setting and lead to successful collaborative innovation, case 3 demonstrates that the lack of a shared vision ends in less commitment between the collaboration partners. Our data analysis also, that an early alignment of all involved actors from the established firm and the entrepreneurial teams supports building a shared vision and a common understanding which positively affects the collaboration dynamics.

The *collaborative strategies* differ from case to case, ranging from long-term and explorative focus (case 1 and 3) to rather short-term implementation and technology transfer focus (case 2). Unexpected from previous collaborative intentions, especially in case 1 it turned out, that during the collaboration three new innovative paths emerged which are now jointly pursued within the network.

#### **4 Empirical findings**

Innovation networks emerge and change during the collaboration process depending on internal and external dynamics in collaboration. The cases show that successful innovation management in partnerships does not depend on attainment of initial targets but on interplay of collaboration dynamics which co-evolve, influencing one another in matching, collaboration, ongoing goal setting and goal finding. In both societal and industrial collaborative innovation, according to our data, following collaboration dynamics enable or block collaborative relief processes and sustainable outcomes:

(1) Identification of heterogeneous social and technical actors (2) Early alignment of interests for long term collaboration in a shared vision (3) Flexibility to enrol new and unusual actors and activities (4) Use of boundary objects to mediate global and local or established and start-up perspectives. Collaboration with strategic dimensions depending strongly on matchmaking processes in the beginning. Matchmaking was identified as an important time-variant period within the whole complex and hardly controllable innovation process which involves internal resources and skills and external demand. The early periods influence later collaboration stages, the development and the outcomes of the innovation process.

For complex innovation, instead of initial goals, a vision that includes all actors' interests has to be developed in networks and partnerships. This envisioning, either recalled by one organization or as shared vision of the partnership or network is found to be long term driver for the overall collaborative innovation process in both investigated fields. This vision can take very different forms, as claim, contract or prototype, helping to identify concrete goals and outcomes in the end.

Furthermore, we found evidence that transparency and forced visibility over complete innovation processes can hamper the development of goals and of sustainable or innovative outcomes. In challenging and turbulent chaotic periods of the innovation process, no capacities are left to communicate to externals. Network capacities are scarce and at some times in the process rather needed for local problem solving than for donor or media relation management (relief). Non-visibility or protection periods are also identified in innovation processes between established and young companies in highly experimental stages.

Referring to Ring and van de Ven's Model, we extend their sequential model with a clear entrepreneurial orientation for collaborative innovation in partnerships. We found that goal finding is a dynamic process leading to a shared vision in collaboration and is thus a necessary step towards successful partnership formation. Goal setting also affects the shared vision, but unlike to traditional management, goal setting becomes part of the collaboration process as a recurring task which leads to concrete execution. In general, the shared vision is the central point in collaboration dynamics and is the managerial lever towards successful or unsuccessful outcomes. This clearly points to entrepreneurial process patterns in collaborative innovation between multiple actors.

**Table 3** Handling goal uncertainty: Findings from long term and initial collaborative innovation processes – extending Ring and van de Ven's IOR Model (1994)

Events	Goal finding	Goal setting	Shared vision	Matchmaking
Negotiating (joint expectations)	x		x	x
Commitment (future action)		x	x	x
Execution (committed actions)		x		
Assessment of collaborative actions	x	x	x	x

## 5 Conclusion and Discussion

Our qualitative study shows how innovation networks evolve and change during the innovation process depending on internal and external dynamics. The paper presented successive case studies and illustrated how successful innovation management in partnerships does not depend on attainment of ultimate initial targets but much on the co-evolution of goals and partnerships around critical changes and events. For collaborative innovation with societal, technological and strategic long-term impact, the goal is often not clear in the beginning.

It has to be developed by heterogeneous partners through a shared vision, in and by the ongoing innovation process. It depends as much from this vision as from the strong vision of a wintered group on a mountain trail - that has to share the strong and irrevocable wish to reach a safe valley however the way in between might look like. In contrast to traditional strategic management with static goal setting and key performance indicators (KPI's) measuring fixed outcomes, goal finding becomes an interactive activity in collaborative innovation processes. It is the essential task in the beginning to find what we observed as "shared vision".

Envisioning is an important initial step of collaboration. A negotiated shared vision that integrates partners heterogeneous interests (Latour, 1999) pushes a high commitment (Ring & Van de Ven, 1994) to implement possible activities. In this, a lot of opportunities can be seen, selected and realized by heterogeneous partners. Only then, there is enough flexibility to adapt and develop recurrently goals. This dynamic adaption helps to reach sustainable innovative outcomes, even if changes in goals are necessary on the way to adapt to new necessities or opportunities. Profiling and common development of powerful visions are important steps from the very beginning of collaboration, in the process of matchmaking (Holzmann, Sailer, & Katzy, 2014). We also contribute to a better understanding of entrepreneurial processes, both for collaborative and managerial action. The suggestion is not to control and monitor in sequential intervals, innovation needs time to prosper and therefore a shared vision is necessary to survive positive and negative dynamics along the innovation journey for long term success.

The findings on collaboration dynamics are useful for all that want to engage in collaborative innovation for societal change. Future questions to be solved could be how goal setting and goal finding can be integrated for managerial long term evaluation towards joint visioning.

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