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**Author:** Holzmann, Thomas O.
**Title:** Matchmaking for open innovation: perspectives on multi-sided markets
**Issue Date:** 2014-12-15
Part III:
A process perspective on matchmaking\textsuperscript{19}

\textsuperscript{19} This part is based on two conference publications and has been adapted for the argumentation in this thesis. Chapter 5.1 is based on: Holzmann, T., Sailer, K., & Katzy, B. 2012. Finding partners for Collaborative Innovation - The vicious circle of matchmaking, \textit{The 26th R&D Management Conference}. Grenoble Ecole de Management. and chapter 5.2 is based on: Sailer, K., Holzmann, T., Katzy, B., & Weber, C. 2014. Co-evolution of goals and partnerships in collaborative innovation processes, \textit{XXV ISPIM Conference}. Dublin.
5 Finding partners for collaborative innovation

The following chapter presents findings from two conference papers and gives insights into the interactions along the matching process on a multi-sided market. The first chapter reports matchmaking dynamics between potential innovation partners and shows that transaction cost theory provides only a limited framework for analysing the matching process. The second chapter presents research insights through a sociological lens and puts interactions in the centre of analysis (Ring & Van de Ven, 1994). The following chapters identify positive feedback loops along the matching process which is named the “virtuous circle of matchmaking” when a common understanding and a shared vision emerges through interaction over time. Negative feedback loops emerge when there is a lack of commitment and no common understanding towards a shared vision. This leads to the “vicious circle of matchmaking” ending in unsuccessful matching processes. These self-amplifying effects lead to network effects on multi-sided markets (see chapter 4.2). Such network effects are a necessary condition for two- or multi-sided markets, but have been rather defined as scaling effects e.g. as adoption of new technologies like fax machines (Katz & Shapiro, 1985, 1986). They become more attractive to customers, the more people use them.

5.1 The vicious circle of matchmaking

The underlying assumption of this chapter is that matchmaking is similar to market transactions following the intermediation theory (Spulber, 2009, p. 13). According to my research agenda, I compared matchmaking with transaction cost economics (Williamson, 1989) and tried to integrate the analysis in a managerial perspective on matchmaking. I found that the transaction cost approach is too static for analysing the matching process. This supports earlier findings and critique, for example those from Hill (1990) or Nooteboom (2006).

20 This chapter is based on the conference publication and has been adapted for the argumentation in this thesis: Holzmann, T., Sailer, K., & Katzy, B. 2012. Finding partners for Collaborative Innovation - The vicious circle of matchmaking. The 26th R&D Management Conference. Grenoble Ecole de Management.
5.1.1 Introduction

In the recent years, there has been an increasing interest in open innovation research and practice. It is a fast growing topic in the field of technology and innovation management (Elmquist, Fredberg, & Ollila, 2009). Phenomena like corporate venture capital and technology scouting departments or (online) innovation intermediary platforms underline the entitled discussion about open innovation. In general, open innovation means to collaborate with external partners or the exchange of ideas, knowledge, technology or innovation across the boundaries of a firm.

Several successful open innovation cases have been reported in literature (e.g. Chesbrough, 2003; Gassmann & Sutter, 2011). However, many partnerships fail in reality. Reasons for failure are manifold, but deviating perceptions and expectations of transactions always underlie a failed collaboration. In traditional transaction cost theory, opportunistic behaviour is assumed to maximise the own profits in (social) exchange which includes individual intentions and expectations (Williamson, 1985). The problem of failed collaboration lies in the matching process for bilateral exchange. Thus, matchmaking can be also seen as part of transaction cost theory (Spulber, 2009). Therefore, the identification and selection of the collaboration partner determine the outcome and success of the partnership which is part of the early stage transaction process. Little is known about these matching mechanisms in terms of open innovation. Thus, finding and identifying the suitable collaboration partner are central questions which are addressed in this chapter.

The study is part of an ongoing research project which includes industrial partners from the greater Munich area. Two participatory case studies were conducted with project partners from industry for understanding the formation process of open innovation partnerships in a real business environment. We present a concept which describes the complexity of the matching process and its importance in the formation of innovation partnerships. Different to a neoclassical market transaction process with perfect information for both agents, the ex-
change between innovation partners includes many uncertainties and risks as shown by Nooteboom (2006). Thus, finding the right innovation partner is a complex matching process with frictions similar to labour markets or marriage brokering.

The chapter is structured as follows. After the literature review on open innovation, asymmetric partnerships and transaction cost theory, we present the methodology of our research. In the further part, we report the results of conducted matching processes and the derivation of a conceptual framework for a better understanding of the early phase of innovation collaborations. This builds the explorative base for further research in the ongoing project. The critical discussion of our results and suggestions for further research concludes the paper.

5.1.2 Matchmaking as transaction process

Collaboration is seen as one important factor for creating value and gaining competitive advantage (e.g. Chesbrough, 2003; West & Lakhani, 2008). In terms of innovativeness and complementary resources, partnerships between young start-ups and established companies can generate synergies resulting in win-win outcomes for both sides (Alvarez & Barney, 2001; Lawton Smith, Dickson, & Smith, 1991; Minshall et al., 2008; Rothaermel, 2002). Although, the involved asymmetries implicate problems in managing these partnerships (Doz, 1987), finding the appropriate partner is even more difficult, as young entrepreneurial firms are often not visible on the market or have not even entered the market yet. This challenge has also been addressed in the study about collaborative partnerships for new product development (Emden, Calantone, & Droge, 2006).

Much has been said about open innovation as a new paradigm for innovation management and value creation (e.g. Chesbrough et al., 2006; Chesbrough, 2003; Gassmann, Enkel, & Chesbrough, 2010), but little has been reported on how to identify the right open innovation partner and how these open innovation partnerships are formed. Hacklin mentioned the early phase which he defined as “set-up” and “initiation” of collaborative innovation partnerships which is a “rather rarely identified subject” (Hacklin et al., 2006). In their study, the searching com-
panies had already a portfolio of potential innovation partners in mind they could choose from. But it is not addressed what happens in terms of problem formulation and search when the established company does neither know about their concrete needs nor about the existence of a potential innovation partner.

Intermediation theory addresses search and matching problems on markets (Spulber, 1999). In the case of open innovation and technology transfer, innovation intermediaries are such third parties who are involved in the search process like a broker or a scouting agent (Howells, 2006; Lopez & Vanhaverbeke, 2009). Three challenges about managing the interactions with open innovation intermediaries were identified (Sieg et al., 2010). First, the involvement of all stakeholders should be ensured. Second, the problem must be selected and “decomposed into manageable elements”. Third, the problem formulation must be on the one hand very specific, but on the other hand open enough for innovative solutions. Additionally, successful transactions from innovation intermediaries have been reported in the literature where search profiles were matched with the right innovation partners or solutions (EC, 2012; Lopez & Vanhaverbeke, 2009), nevertheless complex process mechanisms are behind the matchmaking which need to be better understood.

Classical process stages of inter-firm collaboration are described in five phases: initiation, partner selection, setup, realization, and termination or relaunch (Marxt & Link, 2002). Marxt concluded that the partner selection depends on technological, strategic, and cultural fit and requires a win-win situation for a successful acquisition. Such process steps are in line with transaction cost theory which explains the exchange in or between organisations (Coase, 1937; Picot, 1982). Thus, a transaction cost perspective should provide a reliable framework for a better understanding of the matching mechanisms. A transaction is a contractual agreement between two or more agents and represent frictions in a system or process (Williamson, 1985). Another definition of a transaction “is the creation of value by voluntary cooperation between two or more economic actors. The value created by a transaction equals the benefits ... minus the costs” (Spulber, 2009, p.
In the early phase, ex ante transaction costs like information or negotiation costs are distinguished from ex post transaction costs occurring after closing the contract (Picot, 1982; Williamson, 1985).

Collaboration is the bilateral exchange of knowledge and resources. Thus the exchange is executed through transactions between partners. Transactions are coordinated between a supply and a demand side and explain why firms and markets exist (Spulber, 1999). After the right trading partners have found each other, a transaction is agreed upon and executed. The theory of transaction costs provides an understanding on the economic behaviour of agents during the transactional process on markets or in hierarchical organisations with a focus on exchanges on agent or firm level (Coase, 1937; Williamson, 1975; Williamson, 1991). Transactions on markets are coordinated through price mechanisms, concrete norms, and contracts for economic exchange. While transactions in hierarchical organisations refer to managerial power and strategic or behavioural implications (Remneland-Wikhamn & Knights, 2012), they imply a more relational approach (Dyer & Singh, 1998). These exchanges between agents are comparable to frictions in a system (e.g. signalling, search for information, negotiation or contracting), which make the transaction process flow costly and often in terms of its exploitation economically inefficient (Williamson, 1975; Williamson, 1991, 1998). Therefore, contractual agreements of market transactions should minimize the inefficiencies and reduce opportunistic behaviour. For transaction there are ex ante search and negotiation costs, the transfer of property rights at the moment the transaction occurs (matching) and the ex post execution costs (Picot, 1982).

All these more or less normative approaches assume clear linear transaction processes which are manageable. Matchmaking in this context (which means bringing the right trading partners together) is thus necessary and represent as ex ante transaction costs; while matching is the successful transaction itself according to theory. However, the traditional market perspective assumes that the matchmaking between the trading agents focuses more on short-term transactions, namely a transaction as a single event of exchange which can be undertaken
anonymously on markets (Williamson, 1985, p. 69). This is the case on online platforms like eBay or Amazon or even more specific on innovation and technology platforms like NineSigma or the Enterprise Europe Network.

The involved organizations in a transaction are a locus of parameters affecting the institutional environment and arrangements (Williamson, 1991). These parameters make the market transactions more transparent and explicit that transactions offer a clear approach for evaluation towards their outcome. Furthermore, the explicit and implicit negotiations between two or more actors can also be described as transactions (Nienhüser & Jans, 2004). Matchmaking in uncertain contexts, where no real good for transaction exits is thus studied in this chapter.

Another literature stream from technology management field focuses on technology selection (Gregory, 1995; Shehabuddeen et al., 2006) or technology partner selection (Ortiz-Gallardo, Probert, Phaal, & Mitchell, 2010). In these cases, the requirements for selection can be described or categorized per case.

5.1.3 Methodology

For this study, a qualitative approach was chosen. Insights along the matching process are explored for further research. For an in depth understanding of the recognized problem in practice, a participatory field study with two real projects was conducted. The researcher was actively involved in the cases as intermediary. This is in line with participatory action research approach (Ottosson, 2003; Susman & Evered, 1978). Actions were planned, taken and then evaluated and reflected for the next cycle (Coghlan & Brannwick, 2010). Practical problems were formulated and solved in reality and then used for scientific reflection which is discussed in the following part of this chapter. The main purpose of this study was to get an in depth understanding of the identified problem of matchmaking for collaborative innovation partnerships. Therefore, semi-structured interviews (Bryman & Bell, 2011) were conducted with managers and entrepreneurs before matchmaking, in order to gain an understanding about their expectations of potential partnerships. Furthermore, according to action research field notes
were collected and a survey for action reflection after an organised matching event was conducted which provided the base for theoretical reflection between the research team (Stringer, 2007).

In the first step, two responsible innovation managers (one for each case) from the established company were asked during semi-structured interviews about their innovation needs. Furthermore, the requirements and their offer to potential collaboration partners were documented for a better profiling. The criteria from the interview were transcribed and further developed to an explicit search profile.

<table>
<thead>
<tr>
<th>Planned Process</th>
<th>Applied Method</th>
<th>Involved Stakeholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Problem under-standing</td>
<td>Semi-structured interview</td>
<td>Innovation manager and researcher</td>
</tr>
<tr>
<td>2) Profiling</td>
<td>Survey for (technology) search criteria assessment for profile</td>
<td>Innovation manager and researcher</td>
</tr>
<tr>
<td>3) Search</td>
<td>Semi-structured interviews</td>
<td>Intermediary, potential collaboration partner and researcher</td>
</tr>
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<td>4) Selection</td>
<td>Survey</td>
<td>Intermediary, potential collaboration partner and researcher</td>
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<td>5) Matching</td>
<td>Questionnaire and group observation</td>
<td>Innovation manager, potential collaboration partner and researcher</td>
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<tr>
<td>6) Ex post evaluation</td>
<td>Open interview</td>
<td>Innovation manager, potential collaboration partner and researcher</td>
</tr>
</tbody>
</table>

Table 6: Planned research process, applied methods and involved stakeholder.

Young entrepreneurial firms as potential partners were also asked for their requirements and proposed solutions. The criteria were used to filter and select the relevant start-ups for a matching event. After the
matching event, both potential partners were asked ex post about the matching success.

5.1.4 Description of results

From the perspective of an established company, the innovation managers searched for innovative solutions for their problems. A collaborative solution was desired, as the addressed innovation needs were not the core business of the established firm. Two participatory cases were conducted over a period of eleven months. In one case, an intermediary with an online database was involved in the matching process, while in the second case, no external partner participated during the research process. The research team organised a network event for matching start-up teams and ideas with the managers of the established firm.

Case 1: Production project

A big manufacturing firm searched for new sustainable technologies for either improving their production processes or their products. The cause for awareness was on the one hand based on the need to develop a more sustainable image. On the other hand, an extensive analysis for using external technologies was conducted on the strategic innovation management level. According to the results of the study, the innovation department chose biotechnology as their search field because a lot of ongoing external activities had been identified. Sources for the analysis were scientific articles, consulting studies and patent databases. The background idea was eco-friendly recycling processes and more efficient or cost saving processes in the production line. The searched technologies in the biotechnology sector were not the core competency of the manufacturing firm, that external partners were desired for collaborative innovation partnerships. Especially small and very agile companies should be searched for a rapid implementation.

The innovation manager got the commitment of his Chief Technology Officer (CTO) for the identification of potential innovation partners or technologies, thus, the project was prioritized. Therefore internal tech-
nology scouts were briefed for the search, according to an explicit formulated search profile with the defined requirements. As the outcome of the technology scouts was not successful enough, external network partners were also involved in the search process. The defined external search profile was developed with the researcher and an external intermediary and advertised in an online database.

After six month, no concrete outcome was in sight so that the prioritization from the CTO was revoked which ended in a lower commitment of the innovation manager in the search process. However, the search profile was still in the database of the intermediary and the process was actively managed by the intermediary. More than 60 applications were received via this search channel and four were filtered for the short list.

Another innovation intermediary organized personal meetings and had telephone calls with potential partners where ideas and solutions were discussed and created according to the search profile. The intermediary encouraged the entrepreneurial firms to participate in a matching event, where their concepts could be presented to the innovation manager of the established company. In the end, around 130 entrepreneurial biotech firms were identified of which eight were presented to the innovation manager. With one firm (A), concepts were discussed, as they had already some similar solutions in another industry which had to be adopted. However, with the other firm (B) no coaching was enforced, both entrepreneurial firms were invited for a personal matching. The result of this innovation partner search was one successful matching with firm (A) which was linked to the defined search profile.

**Case 2: Innovation marketing project**

The innovation marketing department of an established manufacturing company searched for new business models in the service sector, especially for a new target group. Social changes in the behaviour of potential clients had been identified in earlier research. New concepts and ideas were searched to make the current product portfolio more attractive to the new target group. For that reason, collaboration with an
entrepreneurial firm was desired for delivering an innovative idea which could be tested in a marketing project with the established firm. In turn, the start-up could benefit from the reputation and a joint project.

In contrast to the first case, no explicit search profile could be defined in this case, and thus, no database could be used. The focus was on the ideation stage for a new business model or service which should be delivered by the start-up. As no concrete outcome was foreseeable, the managerial support decreased and only the research team tried to identify suitable collaboration partners as intermediary.

Nevertheless, the intermediary talked to start-up firms and in two cases separate brainstorm sessions were held in order to find possible solutions for the rather vague requirement profile of the established company. After seven month, the intermediary presented three entrepreneurial teams to the marketing manager. Visionary concepts and prototypes were presented at a separately organised matching event. The teams developed concrete proposals for the collaboration which were presented. Furthermore, an ideation challenge was organised among the participants of the matching event. The winning idea had the chance to realize the concept in a joint project with the established company. The results of this innovation partner search were three unsuccessful matches.

5.1.5 A process approach of open innovation matchmaking

In both cases, the intermediary had the role as matchmaker and process designer, because there was a deviation of the planned process to reality (see table 6). This is in line with other findings about intermediaries (Bessant & Rush, 1995; Howells, 2006; Katzy et al., 2011). Hence, a static matching via databases with a defined search profile with explicit criteria did not lead to collaboration in our cases. In reality, the process is more complex and includes many implicit criteria which cannot be articulated or defined ex ante. However, the online databases increase the probability of a successful matching and support the process of potential partner finding, the matching process is more than only bringing open innovation partners together. The following steps from
The matching process is a mechanism with many different stakeholders involved. In our case these stakeholders are:

a) An established company with its internal\textsuperscript{21} and external\textsuperscript{22} stakeholders which identified a certain problem for an open innovation partnership.

b) Entrepreneurial firms and their team, willing to enter an open innovation partnership with a suitable idea.

c) Innovation intermediaries managing the transaction and information flow between both sides. The intermediary might be a technology scout, consultant and/or an online database.

**Internal problem definition**

The first challenge is the problem identification and definition within an organization. As described in the cases, the explicit formulation of matching criteria is not easy and often, it is impossible for open innovation partnerships. An innovation intermediary helps to find the right criteria and can develop a better understanding of the implicit needs of the company and ensures process flow through active coordination. The implicit criteria need new methods for their evaluation. As these criteria cannot be assessed ex ante, they rather emerge and dissolve over time; thus a dynamic matching approach seems to be promising. This differs from other findings in the literature about the selection of collaboration partners, where explicit strategic criteria, requirements, and goals can be articulated for partner search and selection processes (Hacklin et al., 2006). Innovation is not predictable and thus, other mechanisms must be developed in order to find, match and select the right open innovation partner. As this is a rather unexplored field in research, a matching process approach is proposed in the following section.

\textsuperscript{21} Internal stakeholders are the employees and managers

\textsuperscript{22} External stakeholders are other involved agents e.g. suppliers
1) **Problem awareness** – The key capability of a stakeholder is to identify a certain problem which is out of scope of the core business and might be suitable for a solution by an open innovation partner. In this stage, the requirements for the collaboration partner are not totally clear. On the one hand, it might be problematic to exactly describe the problem in detail and on the other hand, different internal and external stakeholder might have contradicting aims how to handle the identified problem.

2) **Problem recognition** – Once a problem is perceived by a stakeholder, as many as possible internal and external stakeholders who will be involved in the collaboration have to be recognized and a common need has to be defined. In this stage, the problem – that means the requirements of the partner – is rather implicit, but becomes more explicit in discussion with others. Vague and general requirements for the innovation partner are definable.

3) **Problem formulation** – After a better (collective) understanding of the problem and the needs for the potential innovation partner, the problem is described in an explicit search profile. This search profile is the framework for the offered and needed resources, the entrepreneurial firms can apply for.

4) **Problem institutionalization** – The commitment of all stakeholders is necessary, because the change of strategic directions (case one), political influences or operative problems in an organisation affects the success of the matching process and stops the process flow. Therefore steps 1 to 3 can be seen as an iterative decision making circle which ends in a more or less concrete problem formulation.

*External search and process management*

The second challenge is to develop, find and match the right solution to the defined problem. Like internal problem definition, the innovative idea cannot explicitly be described at the beginning. On the one
hand, an innovative idea emerges over time during the partnership and on the other hand, a start-up has a suitable solution for the defined problem, but does not want to publish the idea. For this stage, an innovation intermediary minimizes the information asymmetries between both partners, especially in terms of the implicit criteria which also emerge or dissolve over time.

1) **Ideation for solutions** – Similar to a job application, the start-up team has to find the right propositions for an application to the search profile with the defined problem. In the early stage these ideas are rather implicit than explicit expressible.

2) **Solution transformation** – Once a suitable idea has been discovered, it has to be transformed and adapted in correspondence to the search profile of the established company. For example, a technology or product has to be adapted from one industry to the other. This needs internal resources for the entrepreneurial firm, but might be important for the matching as a concrete outcome presented to the established company.

3) **Solution conceptualization** – After a successful transformation of the solution for the problem, a concept for the application to the search profile should be developed similar to a job application which makes the potential innovation and value explicitly visible.

4) **Application for collaborative innovation partnership** – The entrepreneurial firm applies to the search profile and the intermediary acts as agent between both sides, albeit both potential partners can also directly interact without a third party involved. If the process steps are accomplished, the collaboration partners are matched by an explicitly described problem and solution concept. Furthermore, the intermediary knows the implicit motives, intentions, and criteria from both sides, which makes the potential matching outcome more probable.
Again, the steps 1 to 3 should be interpreted as an iterative solution adoption circle which ends in a more or less concrete concept for an application for the search profile.

Figure 12: A process approach for matching collaborative innovation partnerships

5.1.6 Understanding the vicious circle of matching

From the two reported cases a concept for a better understanding of the matching process is derived (figure 12). We called this the “vicious circle of matching” (figure 13), because of the similarity to a negative feedback circle of process and system theory. We identified the problem definition phase and the creation of the search profile as the crucial step in the process chain. The process flow remains stable, as long as there is a clear formulation of a problem and an institutionalized commitment of all stakeholders of the searching side. The explicit description holds out a certain outcome which leads to an internal promotion of the intended search for collaborative innovation partners. However, the matching process for innovation is mainly driven by implicit criteria which cannot be well defined in the beginning. This is quite obvious, because innovation always is something new. Thus, it is more or less a vague feeling towards strategic visions managers can express which is converted to more explicit requirements over time once a shared vision for all stakeholders emerges. The crucial task of the matching process manager is the capability to handle both types of implicit and explicit criteria from both sides in order to manage the transactions of each single process step (Katzy et al., 2011). If one of the process steps is not accomplished, the matching deviation of the requirements of both sides increases, that in the end, the matching might be terminated unsuccessfully. In other words, if there is no concrete problem formulation, the institutional support is missing which
ends in a lower stakeholder commitment which has a negative impact on the whole matching process. The ‘vicious circle of matching’ starts with an insufficient understanding and formulation of an implicit requirement and ends with unsuccessful matching.

From the perspective of the entrepreneurial firm, the ‘vicious circle of matching’ starts with developing ideas which are realizable through partnerships, therefore the understanding of the search profile from all stakeholders, including the innovation intermediary, is necessary. The application for the collaborative innovation partnership must be aligned with the search profile of the established company. That means if the concept of the solution is not in line with the stated problem and the deviation of the stated criteria is too large, the application is not considered for matchmaking. Again, misinterpretations of the search criteria in the beginning increase the probability in terminating the matching process.

![Figure 13: The vicious circle of matching – problem definition (established company) and solution creation (entrepreneurial firm) for collaborative innovation partnerships.](image)

### 5.1.7 Discussion and conclusion

The paper presented a process framework of matching processes in the early stage of open innovation partnerships derived from two participatory action research cases. The results were socially constructed in reflection meetings within the research team and the participants of the action study. It turned out, that transaction-based reasoning according can only be applied when a clear search profile can be defined. The matching process for innovation which is linked to uncertainty is a
dynamic process with several interactions over time which cannot be clearly explained with transaction cost economics. Similar critique about the rather static approach of transaction cost has already been accepted by Williamson (1999, p. 1103). Matchmaking can be seen as part of transaction cost theory, but before the transaction occurs. The three stages of a transaction process according to Nooteboom (1999) can be divided in contact, contract and control. My study shows the contact stage as matchmaking and provides interaction pattern between participating agents in a hierarchical organisation, the external intermediary and potential innovation partners. Matching dynamics are outlined as “vicious circle” which can also lead to a “virtuous circle”. In my research, I link such dynamics to network effects on two- or multi-sided markets which show social interaction as matching mechanism rather than for example price finding or explicit contracting. The main finding of my study is the interplay between explicit criteria and implicit assumptions towards innovative solutions. This study is extended in the next chapter where external data from disaster management is triangulated with my case data.

These findings might have potential for further research on matchmaking in the light of cognitive distance between market agents for open innovation or the interplay between intrinsic or extrinsic motives towards collaboration or co-exploitative and co-explorative intentions (Parmigiani & Rivera-Santos, 2011).

Managerial implications

The vicious circle of matchmaking starts within an institution with the identification of innovation needs. Often, the management does not recognize these needs, as routines of daily business are too dominant and there is no time for thinking out of the box. Another problem is the hierarchical structure of established companies with many political and strategic implications. This “problem finding stage” is already very difficult for managers. Which identified problem can be solved with external innovation partners? Once a problem is defined and an internal innovation project is initiated, many internal and external stakeholders are involved in this project. If the manager of an established
company searches now an appropriate collaboration partner, many
decision makers are involved along the matching process. The more
people are involved, the higher the failure rate of the partnership. On
the one hand, it might be possible, that the operative level does not
understand the external innovation or technology (“not invented here
syndrome”) or on the other hand, the strategic management changes
the direction which might also be negative for the CIP. For a better
matching quality, all stakeholders should be involved in the assess-
ment of innovation demands.

The search and matching process for the suitable innovation partner
should be externalized, as the managers are too deeply involved in the
daily operational business. For a better quality of the search results, an
innovation intermediary can be involved with exclusive network ac-
cess. This has two advantages:

- First, the process is permanently managed by the external scout
  who minimizes information asymmetries
- Second, the potential partners are trained and prepared for the
  matching event which represents a trust building mechanism.
  Entrepreneurial firms might be afraid of losing their ideas
  when they negotiate with established companies

When potential partners could be identified, it is necessary that all
stakeholders attend the matching event, because the selection is a
complex group decision process.

**Conclusion and further research**

The paper has explored the matching process of collaborative innova-
tion partnerships, based on two practical cases. A conceptual process
framework was presented based on transactions of implicit and explicit
criteria in process chains. The concept needs to be tested in further
cases.

Like usual business processes, which describe explicit flows of inputs
which are transformed to visible outputs, the complex matching proc-
ess can also be defined as a transaction chain of steps, but based on interaction. This argument follows Gregory who mentioned that process management is influenced by humans and thus, explicit or implicit routines determine the flow (1995). Therefore, it is important to identify these routines, intentions and criteria, especially the implicit ones as they cannot be articulated ex ante for an in-depth understanding. Only if the rather undefined or vague ideas at the beginning of the partnership formation process can be transformed in a shared vision, matchmaking will likely occur. Andrew Van de Ven mentioned, “the innovation process is managing new ideas into good currency” (Van de Ven, 1986) which implies to make implicit ideas explicit for all market agents. Nevertheless, a deeper theoretical understanding of the matching mechanisms has to be developed from other theoretical perspectives than the transaction cost approach.²³

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²³ **Acknowledgements**
This paper has been produced as part of the three year research project INNOSTART, supported by the FhProfUnit program of the Federal Minister of Education and Research of Germany. We would like to thank all the involved partners from industry and research for their active support and contributions.
5.2 The virtuous circle of matchmaking

In chapter 5.1 it was shown that transaction cost theory is a rather static approach and does not explain the complexity of interactions and decisions along the matching process. From action reflection, I conclude that the dynamics of the matching process are based on interaction. These identified patterns of interaction arise in uncertain processes with an unclear outcome. In chapter 5.2 the findings from 5.1 are triangulated with external data from network formation in disaster management. It turned out, that the transaction is not the unit of analysis for matchmaking; it is a shared vision and a common understanding which has to emerge for long-term relationships. Consequently, the findings extend the model of Ring and Van de Ven (1994) which is based on a sociological perspective.

5.2.1 Introduction

This chapter 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 with economic impact still are rare (Hargrave & Van de Ven, 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

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24 This chapter is based on the pre-published conference paper and has been adapted for the argumentation in this thesis: Sailer, K., Holzmann, T., Katzy, B., & Weber, C. 2014. Co-evolution of goals and partnerships in collaborative innovation processes, XXV ISPIM Conference. Dublin.
process uncertainty (Katzy et al., 2013), demand and resource uncertainty (Mizruchi & Stearns, 2001).

Despite uncertainty along collaboration innovation processes, it seems not to hinder success as for example shown in regional settings of Bio-tech clusters (Powell et al., 1996) or the open innovation cases of BMW and Apple in chapter 1 of this thesis. 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). Therefore, it turned out to be interesting to investigate this dynamic in an ongoing collaboration process, allowing zooming in and better understanding important steps of partner finding and matchmaking 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 iterations, 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.

In the next section of this chapter traditional models of innovation management are presented, literature on formation of collaboration is added and tries to connect both for collaborative innovation processes. The still missing explanation for handling goal uncertainty heads us 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 matching processes and open innovation towards more sustainable outcomes.

5.2.2 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 entrepreneurship on the other (Cajaiba-Santana, 2014; Carvalho, Fleury, & Lopes, 2013; Hargrave & Van de Ven, 2006; Mulgan, 2006; Zhou, 2013). 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 (Hargrave & Van de Ven, 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 et al., 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. Therefore the social microstructure and interactions of a multi-sided market for open innovation is shown in this study. The interactions of Ring and Van de Ven’s model are taken as starting point and extended by findings from our cross-case analysis.

The interactive 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. This is in line with the already discussed definition of a transaction in form of the transfer of property rights following a transaction cost theoretical perspective (Nooteboom, 2006; Picot & Dietl,
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 et al., 2014a). Such a point also can be seen as initial dynamic of matchmaking.

Figure 14: The cyclic process model of inter-organizational relationship formation (similar to 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.
5.2.3 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.

Disaster Management for sustainable long-term impact\footnote{This section belongs to my research and PhD colleague, Christina Weber who researches network dynamics in disaster management. By comparing our findings, we found similar patterns in our process analysis. The section is part of my thesis as the paper has been already pre-published, but I focus my argument on matchmaking for innovation partnerships and not on disaster management. It shows, that also other research disciplines profit from research on matchmaking and vice versa.}

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.

With regards to goal setting, different goals came up and became realized in disaster management in the different networks. Table 7 gives an overview illustrating how network- depended relief measures are.

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With regards to goal setting, different goals came up and became realized in disaster management in the different networks. Table 7 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.

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

Table 7: Collaborative dynamics in disaster management.

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 environment, 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.
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 defined by managers of the established company.

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).

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 potential entrepreneurial partners. In the end, two concrete collaborations were initiated, which are studied in this paper. For better contrasting of our findings and a wide scope of lessons learned, we also present one unsuccessful case, where no matching occurred.
<table>
<thead>
<tr>
<th>Collaborative Dynamics</th>
<th>Case 1: Successful collaboration formation for joint innovation</th>
<th>Case 2: Successful collaboration formation for technology transfer</th>
<th>Case 3: Unsuccessful collaboration formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal setting</td>
<td>Development and Implementation of public charging technology; Bilateral NDA; Resource commitment for collaboration; Integration in OEM’s innovation network</td>
<td>Clear contracting with timelines and deliverables, like in classic supply chain management</td>
<td>Development of technology implementation roadmap; Integration of interface technology for prototype testing</td>
</tr>
<tr>
<td>Goal finding</td>
<td>Attraction with intelligent public charging solution; Joint ideation at matching event and several follow up meetings; Suitable and complementary technology for long term strategy ongoing (started 10/2012)</td>
<td>Based on technological requirements stated in a catalogue (like a supplier); Technological feasibility with short term realisation of goals operationalised</td>
<td>Attraction with open platform for public charging services; Joint ideation, prototyping and technology implementation; Several follow up meetings terminated</td>
</tr>
<tr>
<td>Shared visioning</td>
<td>Partnership for public charging infrastructure and business model for 2020 vision</td>
<td>Partnership for building supplier diversity for existing charging infrastructure.</td>
<td>A shared vision started to emerge, but did not end in concrete collaborative efforts</td>
</tr>
<tr>
<td>Matchmaking</td>
<td>Intermediaries coordinated the matching; later the start-up became associated member in EV Charging joint venture</td>
<td>Intermediaries coordinated the matchmaking; supplier contracting based on existing technological solution</td>
<td>Intermediaries coordinated the matching; loose collaboration started, but terminated</td>
</tr>
<tr>
<td>Collaborative strategy</td>
<td>Exploration of new technological approaches and innovative open business models</td>
<td>Technology transfer from start-up side as supplier; established firm as resource enabler</td>
<td>At the beginning, exploration for technological integration</td>
</tr>
</tbody>
</table>

Table 8: Collaborative dynamics in industrial management.
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 shows, 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.

5.2.4 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 in organisational hierarchies and in networks
3) Flexibility to enrol new and unusual actors and activities
4) Intermediaries coordinate the matching between global and local or established and start-up perspectives.

Collaboration with strategic dimensions strongly depends 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 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.
Table 9: Handling goal uncertainty: Findings from long term and initial collaborative innovation processes – extending Ring and van de Ven’s IOR model (1994).

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 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.

5.2.5 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 rather 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 regardless 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 et al., 2014b). 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, since 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 who wish to engage in collaborative innovation for societal change. Future questions to be answered could be how goal setting and goal finding might be integrated in managerial long term evaluation towards joint visioning or computational matching tools for automated coordination.
5.3 A conceptual matching matrix

Based on cross-case analysis of data from the action research studies, I identified different intentions towards prospective innovation partners which are summarized in a conceptual matrix for managerial decision making. Learning in organisations or inter-organisational networks is distinguished between exploitation and exploration (March, 1991). Exploitation is driven by efficiency and incremental improvement while exploration aims to discover something new and unexpected. Collaboration intentions towards open innovation partnerships are assessable based on the exploration and exploitation framework. As shown in Santamaria and Surroca (2011, p. 104 ff.) the motivation of firms entering strategic alliances for exploitation or exploration determines the matching. Following the criteria from the meta-review for co-exploitation and co-exploration in inter-organisational relationships (Parmigiani & Rivera-Santos, 2011), I hypothesise that a matching process for pure exploitative intentions can be coordinated similar to market transactions, like supply chain operations, technology or IP transfer for exploitation. In this case, clear criteria towards the innovation needs can be defined (as shown in chapter 5.1). In contrast to matchmaking for explorative partnerships where criteria co-evolve along the matching process (as shown in chapter 5.2), which is per definition the case for innovation.

The chapters 4.1, 4.2, 5.1 and 5.2 have shown that pure market transaction cannot fully explain the matching process on a multi-sided market. Transaction cost theory on markets works if property rights can clearly be assigned, like this is the case of intellectual property rights or already developed products. My focus on matchmaking for open innovation in this thesis is of exploratory nature and thus, requires intensive interaction mechanisms. For managerial action, the following matrix is derived from the profiling stage as ex ante analysis of collaborative intentions and requirements. Further research could discuss the linkage between the typology of transactions, as shown in

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26 See criteria in appendix 10.2 which were used for constructing the semi-structured interview guidelines.
(DeBresson & Amesse, 1991) and the findings on matchmaking in this chapter in particular.

The matching matrix supports research results on network structures for open innovation (Powell et al., 1996; Weng, Yang, & Lai, 2014). The authors found that networks for exploitation have dense structures and strong connections in the core and networks for exploration are peripheral, or do not even exist yet. Thus matchmaking for exploitation is more efficient than matchmaking for exploration. In the first case (co-exploitation), stable supplier network in the automotive industry exists, the stakeholders are known and search and matching criteria can be defined. This is in line with matchmaking or ‘competency rallying’ in stable networks as shown in Katz and Crowston (2008). In the second case (co-exploration), potential partners are not known and search and matching criteria cannot be completely defined. Matchmaking for co-exploration is a matter of new network formation which requires social interaction on a multi-sided market where collaboration emerges over time leading innovative concepts, new business models and economic return in future. Morris Teubal et al. (1991) stated:

“Network development may be viewed as an evolutionary process triggered by innovation, that is, by the increasingly successful coupling of technology (or technological knowledge) and user needs. This coupling is ignored in economic theory, since it is usually assumed that products and technology already exist, so that the only problem is to determine equilibrium prices and quantities. The qualitative coupling phenomenon is implicit in the analysis; its lack would mean that no market exists.”

On the following page the matching matrix is shown in table 10.
<table>
<thead>
<tr>
<th><strong>Matchmaking for co-exploitation</strong></th>
<th><strong>Matchmaking for co-exploration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology transfer databases</td>
<td>Entrepreneurial partnerships</td>
</tr>
<tr>
<td>IP transfer databases</td>
<td>Collaborative innovation</td>
</tr>
<tr>
<td>Customer relationships</td>
<td>Ideation and crowdsourcing</td>
</tr>
<tr>
<td>Supply chain relationships</td>
<td>New business development</td>
</tr>
<tr>
<td>➔ Existing networks for present innovation topics for execution</td>
<td>➔ Future innovation topics for visionary projects for market creation</td>
</tr>
<tr>
<td>➔ Concrete search criteria definable and goals can be formulated</td>
<td>➔ Search criteria and goals co-evolve over time.</td>
</tr>
<tr>
<td>“I know what I am searching for”</td>
<td>“I don’t know what I am searching for”</td>
</tr>
<tr>
<td>➔ Transaction based matchmaking</td>
<td>➔ Interaction based matchmaking</td>
</tr>
</tbody>
</table>

**Table 10:** A conceptual matching matrix.