Matchmaking as multi-sided market for open innovation

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Abstract

An obvious task in open innovation is to find suitable partners for collaboration. In this paper we present results from three participatory case studies of identifying and matching technology firms for collaborative innovation projects. We observe that matchmaking is a more complex process than an (online) market transaction. The cases show how innovation intermediaries organize the matching process as external service-providers and what economic contribution they can have. The paper conceptualizes matchmaking for collaborative innovation as economic resource allocation process in the shape of a multi-sided market which involves the innovation partners and intermediaries. The paper concludes with theoretical and practical implications that such a conceptual lens opens for exploratory technology analysis projects and the management of matching processes for partnership formation.

Keywords: open innovation, collaborative innovation, matchmaking, matching process, two-sided market, multi-sided market

1. Introduction

Open innovation promotes a more collaborative and networked approach to innovation and highlights the strategic benefits of transferring ideas, technology, knowledge and intellectual property (IP) between firms (Chesbrough, 2003). Economic exchange between firms happens in markets and a number of dedicated (online) market places have been established for exchanging and trading technologies and innovations. Some of these market places are commercial, others are publicly funded. Most emerged in the past decade and share the mission to facilitate market transactions between open innovation partners by matching a particular innovation demand with the corresponding supply (Howells, 2006; Klerkx & Leeuwis, 2008). The shared assumption is that the exchange of technologies and ideas can be coordinated through market mechanisms. Recent studies, however, show that especially markets for technology and innovation are imperfect and do not always work

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properly (Arora, Fosfuri, & Gambardella, 2001; Cesaroni, 2004; Lichtenthaler & Ernst, 2007). Organizational hierarchies are the classical economic coordination alternative when markets fail (Williamson, 1975).

Alliances are a known mechanism e.g. in R&D Management to build quasi-organizational hierarchies in inter-organizational settings (Osborn & Baughn, 1990; Parmigiani & Rivera-Santos, 2011; Sydow, 1992). Literature provides some success stories of such alliances as well as testimonies of failures (Littler, Leverick, & Bruce, 1995; Marxt & Link, 2002). Especially in the early phase of exploratory innovation, when the outcome is still unclear, concrete requirements towards collaboration partners are often difficult to formulate or change. In consequence, innovation collaboration can fail simply due to wrong partners involved. As the formation of R&D alliances is a long-term investment frequent changes in uncertain environments lead to high transaction costs or - in case of abandoning of the project - to “sunk costs” and irretrievable losses for the involved partners. Process models of R&D alliance formation from literature therefore distinguish between a more stable network of competencies and resources, what Katzy and Crowston (2008) call the rallying process for projects that follow changing opportunities. Some projects require partners beyond the pre-existing network, for example, because the innovation, addresses opportunities in new markets, new industries, or through new technologies that go beyond the competencies of the firm and its existing network partners. In any case, there are situations that call for “opening” the network.

The aim of this paper is to understand how firms find collaboration partners beyond their current networks. The emergence of collaborative innovation projects on electro-mobility in the Bavarian automotive industry offers an insightful research setting to study this question because relevant technologies, services, and suitable business models for the production and launch of new electro-vehicles requires partnering beyond the scope of the existing automobile supply chains: energy providers, Internet firms or young start-ups are expected to play a future role. In our case studies BMW searched for innovations and new technologies from young entrepreneurial firms. In order to gain deep understanding on the managerial processes we joined the effort of establishing new partnerships in three different cases following van de Ven’s engaged scholarship study approach.

We observed an extensive matching process over several month through which new partners engaged in collaborative projects. In the course of this process technological trends as well as new business models were explored, which lead to innovation transfer between the future collaboration partner firms. In consequence, inter-organizational coalitions of individuals formed and new partners often joined different projects than the initially intended ones. Rather than a single transaction, the extension of the innovation network emerged as a priority. Transactions, in form of contracts were only signed late in this process. Innovation intermediaries provided an essential contribution for this to happen in providing access to mainly invisible small entrepreneurial firm networks, in facilitating trust building between individuals, and in process coordination.

We contribute to theory by conceptualizing matchmaking as a multi-sided market, coordinated action of the party demanding innovation services, the party supplying innovation services, and the innovation intermediary. The nature of multi-sided markets - in contrast to simple markets - is that the transaction is not limited to a point in time but a process with long duration over time. The economic rationale of a matching market for open innovation is complemented with a managerial component of coordinating the process. In doing so the paper as well contributes to defining the role of innovation intermediaries as partner in the multi-sided market process. The practical impact of this novel theoretical perspective is a
shift in the understanding of the managerial roles in the early phases of establishing open innovation partnerships.

The reminder of the paper is structured as follows. In the second paragraph, we give an overview about the literature on innovation intermediaries, matchmaking and two-sided markets. The third paragraph summarizes the qualitative research methodology and describes the setting of the cases. We then present results of the participatory case studies in the fourth paragraph, which ends in a discussion and implications for theory and practice in the fifth paragraph.

2. Matchmaking and the economic setting for open innovation

With the increased interest in open innovation and the suggestion of trading IP, technologies and innovation on markets (Chesbrough, 2006) more studies on such markets are undertaken from different disciplinary backgrounds. Innovation economics researcher rather found that technology and innovation markets fail and identified reasons for failure, e.g. that information asymmetries result in a frequent mismatch between demand and supply and consequently lead to exaggerated search and transaction costs (Arora et al., 2001; Cesaroni, 2004; Lichtenthaler & Ernst, 2007). Innovation intermediaries have been observed and generally described as solutions to market failure, as broker agents or facilitators for technology transactions (Galbraith & McAdam, 2013; Howells, 2006; Lichtenthaler & Ernst, 2008a). This is in line with economic literature, where intermediation theory is used to explain how firms create markets and reduce transaction costs by efficiently matching demand and supply and thus showing a concrete economic value to market agents (Spulber, 1999; Spulber, 2003). In the light of this theory too little is known of the market structure and its mechanisms for economically efficient open innovation (Lichtenthaler & Ernst, 2008a).

On a simple commodity market, matching between demand and supply is clear and frictionless. All necessary information is assumed to be available so that trading partners can find each other for efficient transactions. The classical structure of commodity markets therefore is one-sided which means e.g. a producer can sell goods via a re-seller to the customer. This simple one-sided market logic does not explain matchmaking mechanisms and reciprocal interactions between two or more agents of the type that characterize collaborative settings in innovation networks. Furthermore, the term one-sided market is generally misleading, because each market needs at least two sides - demand and a supply - for a successful transaction (Evans & Schmalensee, 2005).

For this reason, the theory of two-sided markets (Rochet & Tirole, 2004) gained more importance in academia, especially related to the fast growth of e-businesses like eBay™, Facebook® or Google™. Such online platforms facilitate trading partners to find each other autonomously. Similar to “switchboards” (Mowshowitz, 2002), these platforms use algorithms to efficiently match demand and supply so that users easily can choose between alternatives. It is not surprising that online platforms also appeared for technology and innovation transfer. Examples are the Enterprise Europe Network (EEN), InnoCentive® or NineSigma® and are described in literature (Chesbrough, 2006; Lopez-Vega & Vanhaverbeke, 2009). They create online market platforms where innovation proposals are matched with problem owners for a transaction or problems are posted to potential problem solvers.
The economic rationale is a two-sided market where demand and supply interact via the online platform as depicted in figure 1a (Rysman, 2009, p. 125) or directly interact with each other through affiliation with the platform as depicted in figure 1b (Wright, 2004, p. 44). The main characteristic of these markets are network externalities (Katz & Shapiro, 1985) which play an important role in building the market: matchmaking depends on a critical mass of transactions, which increase with high numbers of platform-users on both market sides who attract each other. Examples are dating agencies or online recruitment platforms. Research on two-sided markets is mainly economic aiming at understanding the pricing structures (Rochet & Tirole, 2006) or antitrust policy (Evans, 2003). Empirical research about market structures and market mechanisms is scarce. Little is known how innovation markets are structured and whether innovation intermediaries only offer passive database-platforms or need to get actively involved in the market as market maker with active managerial support (Lichtenthaler & Ernst, 2008a). A clear definition of such networked markets is still missing in literature.

From a managerial perspective, three open innovation processes have been distinguished for technology and innovation markets by Gassmann and Enkel (2004). The outside-in process and the inside-out process are comparable to the above described market transactions for commodity markets as either the transfer of IP, technology or innovation from external partners into the firm or the commercialisation of internal IP, technologies or innovation to external buyers has to be coordinated. The third process, the coupled process, focuses on open innovation in collaborative settings like R&D alliances or in innovation networks and follows bidirectional/reciprocal transactions. Compared to the many studies on technology transfer for exploitation (e.g. Tietze, 2012) there are very few studies on the coupled processes namely the finding of partners for collaborative innovation in strategic, long-term projects (Hacklin, Marx, & Fahrni, 2006).

While technology transactions can readily be explained as single transaction in the sense of transaction cost theory (Remneland-Wikhamn & Knights, 2012) the formation of collaborative partnerships requires other theoretical approaches that include the impact of relational interactions (Mortensen, 1988). Previous findings suggest that firms involve innovation intermediaries “as a complement rather than as a substitute for internal resources” (Lichtenthaler & Ernst, 2008b, p. 1025). And Katzy et al. (2013) show the operational involvement of innovation intermediaries in the firm’s innovation process for actively coordinating the matching process with the responsibility for concrete resources. Relational interaction processes in inter-organisational relationships have been conceptualised for innovation with more exploitative and more explorative nature (Parmigiani & Rivera-Santos, 2011).
Matching theory offers a more generalized approach of market transactions than transaction cost theory. Matching theory explains the microstructure of markets, the how and why economic transactions work (Spulber, 1999). Alvin Roth and Lloyd Shapley were awarded the Economics Nobel Prize for their contribution to market engineering and mechanism design. Markets for different services require different mechanisms, which relates economics to computer science in market design to solve market frictions (Veit, 2003). Market efficiency is formulated as design challenge to be addressed by operational, algorithmic, or game theoretical means (Roth & Sotomayor, 1990). The design of marriage algorithm for dating markets (Gale & Shapley, 1962) and top trading cycles and chains for kidney exchange in medical markets (Roth, Sönmez, & Ünver, 2005, 2007) or the high-school matching programme demonstrate the potential of matching theory (A. Roth 2002). Open innovation, following this line of thought, is a distinct market that requires specific configurations of market mechanisms, for which the requirements need to be identified.

3. Participatory research approach and case study description

Our research approach followed the engaged scholarship philosophy which suggests an advancement in management sciences by actively participating in practical settings and contributing to theory development by solving practical problems (Van de Ven, 2007, p. 2). For the execution of the study we designed three action research studies according to Susman and Evered (1978).

<table>
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<th>Research Setting</th>
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<td>1 semi-structured interview (ex ante)</td>
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Table 1. Research setting and qualitative data collection.
We were involved alongside the innovation intermediary to explore patterns in the matching process, identified problems within the process, contributed to developing solutions, and their implementation, and studied the effect of the undertaken actions. Data collection followed the cycle of action research (Kock, McQueen, & Scott, 1997). Sources for data collection (see Table 1) were semi-structured interviews with involved managers and the small entrepreneurial partner firms, who were each interviewed about their requirements and expectations before the matchmaking and about their evaluation of the experience after the matchmaking. Interviews were complemented by field observations, meeting participation, and document analysis all along the process.

Conceptualization was undertaken through coding of the field data and its analysis in the light of existing theory (Eisenhardt, 1989, p. 544). From cross-case analysis, we extracted patterns of matchmaking from which the here presented model emerged. The three cases included 6 managers of different departments of BMW and over 30 further employees, the two innovation intermediaries called Bayern Innovativ and Munich Network and the invited entrepreneurs. Large firms, other than BMW, were excluded from this study, as they are already visible on the market and better known.

The research method is exploratory and qualitative for an in-depth study of the process of the emerging innovation partnerships. We attended the matching processes for three projects between 2010 and 2013 and compare them to identify the patterns described in the paper.

3.1 The Bavarian automotive industry in search of innovation partners

Bavaria is famous for its high-tech industry, its technology clusters, university-industry cooperation initiated by the Bavarian state and its leading entrepreneurial activities in Munich. Audi and BMW are the two Bavarian automakers that are central players in the Bavarian automobile cluster. This setting gave us the opportunity to study the formation of innovation networks and emerging innovation partnerships. In concrete our research involved BMW as a large firm searching for innovative entrepreneurial partners for building new ties in innovation networks outside their stable supplier network. Two innovation intermediaries participated in the studied projects, the publicly supported Bayern Innovativ, which is member of the EU funded European Enterprise Network (EEN) initiative, and the private Munich Network (MN) which offers networking and matchmaking services since 1996.

Recent changes in the German automotive industry, forces Original Equipment Manufacturers (OEM) to adapt new concepts for electro-mobility. The National Electromobility Development Plan of the German Federal Government set the target of one million electric vehicles till 2020\(^2\). This transitional phase forces OEM’s to invest in new technologies and to find technologies and innovative business models outside their core business. The roadmap towards more sustainable cars and value added services for the customers requires new partners for collaborative business models e.g. with electronic power producers or charging infrastructure providers, especially in combination with ICT solutions. In such transitional phase, many entrepreneurs create innovative solutions which can lead to future markets (Rothaermel, 2002), like this was the case in car sharing initiatives, charging infrastructure or mobile energy storage.

\(^2\) [http://www.bmvbs.de/EN/TransportAndMobility/Technology/ElectricMobility/electric-mobility_node.html](http://www.bmvbs.de/EN/TransportAndMobility/Technology/ElectricMobility/electric-mobility_node.html) (11/14/2013)
Unlike the traditional automotive supply chain, where innovations are created by the well-known suppliers in the well-structured tiered network organization, it is difficult to find such entrepreneurial firms outside an OEM’s stable supplier network. For this reason, innovation managers and technology scouts from BMW asked to study new sourcing processes in order to better understand open innovation and to find new innovation partners for collaborative innovation. Together, we set up three projects with different departments involved. In our cases, we covered corporate functions ranging from corporate strategy, R&D management, product management, manufacturing, innovation marketing and sales each with different innovation managers and their specific requirements towards potential innovation partners.

3.2 Case 1: Process innovation in the production line

In our first case, the involved innovation manager searched for innovation in the production line for more sustainable manufacturing processes. Based on detailed internal analysis concrete technological search criteria were specified which led to a structured process, similar to the selection of new suppliers or technology exploitation (Marxt & Link, 2002). We published a technology request on the EEN database and actively scouted potential partners. After eight weeks of search, we had over 100 potential partners in our portfolio. Most of them were identified on the EEN database. As the innovation manager did not have the time to evaluate all profiles, the intermediary team pre-selected the most promising ones according to the manager’s requirements. With one biotech start-up firm from eastern Germany, for example, ideas for a joint project were developed and presented to the BMW manager. After his positive evaluation a half-day matching event was held and the concepts were discussed more in detail between the manager and the entrepreneur. The entrepreneurial firm presented their biotechnology solutions, a business case of significant cost reduction through more efficient recycling processes and innovative ideas for collaboration. All participants gave a positive feedback on the matching event and follow up meetings were decided between the participants.

The intermediary team coaching before the matching event did reduce information asymmetries between both sides and was essential in creating a trustful and open environment for discussions. On the one hand, the biotech firm gained concrete understanding of the needs of BMW which enabled them to develop concrete project ideas. On the other hand the intermediary team interfered with the internal processes, for example when the innovation manager from the production line, had to pass on to the responsible technician to explore potential implementation. After some weeks, when the research team conducted telephone interviews for the ex post analysis of the matching success, it turned out, that the process had dropped dead as parties have not had further meetings. The responsible process engineer had been absorbed with production line issues and the entrepreneurial firm equally had other priorities. All involved parties agreed that there was a gap in the matching process and asked for active managerial support by the intermediary.

3.3 Case 2: New ideas for service innovation

In the second case, the innovation marketing department searched entrepreneurs and student teams for service innovation ideas. The responsible innovation manager also wanted to get involved in the entrepreneurial network in Munich for improved access to new ideas and new ventures. It proved impossible to fill in the criteria for a search pro-
file in an online platform so that systematic online scouting was not possible. Therefore, the intermediary team organised a trade show, invited entrepreneurs, local investors, and student teams with their projects, and launched an idea challenge for future services around the car. For better matchmaking with participants from BMW three selected start-up teams were coached in their development for a potential collaboration. The intermediary team systematically facilitated the exchange and matched the managers with the entrepreneurs and the student teams. For example BMW and a start-up from Mountain View that was founded in 2003, were brought together for collaboration through this process. The US start-up got an exhibition booth at the trade show and a live video call with one of the founders was arranged. Post mortem analysis showed that intermediation between the entrepreneurial scene and BMW was considered as inspiring and many new business contacts emerged.

3.4 Case 3: Collaborations for EV-charging infrastructure

The third case had its origin in the corporate strategy department. The aim was to explore new business opportunities for the launch of the first electronic vehicles (EV) in 2013. Business partners for a joint development of charging infrastructure or additional services were required. In a joint meeting the intermediary team systematically involved more managers than in the first two cases. In particular, an innovation intermediary from the network and four managers from the sales, R&D, strategic and product management department, contributed to this project. The aim was to set up an internal team for the matching process, in order to gain a more complete picture toward the requirements from different departments. Based on the common search profile, the intermediation team created a webpage where potential partners could apply for a two day’s matching event in Munich, similar to a job recruitment platform. At the end of the recruitment process, 71 applications were received, were pre-ranked and presented to the managers. 12 selected entrepreneurial firms were invited to the matching event. Based on action reflection of the first two cases, the team involved many managers to the matching event, with the aim to increase matching success and avoid low commitment for the matching process. Over 30 managers from different departments participated at the event.

On the first day, the intermediation team coached the entrepreneurs to reduce information asymmetries and explained the background of the matching event. On the second day, the team organised a public pitching session and later 12 one-on-one meetings for a deeper matchmaking session. As expected, we observed matchmaking efforts between the managers of BMW and the entrepreneurs. Beyond that, we also observed interesting exchanges between the employees of BMW and some entrepreneurs reported successful business contacts with other start-up firms which end up in joint projects. Our ex-post analysis showed five further negotiation meetings and technology assessments between managers of BMW and the matched start-ups which end up in three collaboration projects. We further experienced, that coordination of these follow up meetings still remained necessary due to the high workload of the involved managers, cultural or simply time differences.

4. Findings from the action study and learning

Our observations in the case clearly confirm that, matchmaking is an interactive process which emerges and changes over time. These use fully automated transactions like on technology transfer platforms or other online databases but need additional managerial
support similar to what is reported in literature (Bessant & Rush, 1995; Katzy et al., 2013; Lichtenhaler & Ernst, 2008a). In contrast to other contributions to the discussion on open innovation markets, we found that matchmaking is more than only a market transaction between two trading agents on a two-sided market (Chesbrough, 2006; Lopez & Vanhaverbeke, 2009). Our observation suggests that this is especially the case for technology exploration projects with strategic long-term impact, because concrete requirements on innovation partners cannot be clearly stated at the outset. In such circumstances the innovation intermediary contributes to matching success by creating a partner network based on the requirements of innovation seekers. Through interaction of the agents collaboration emerges and – in the successful case - over time a common vision evolves that ultimately leads to a contractual transaction.

This leads us to conclude that matchmaking is better modelled as a multi-sided market where the supply and demand comes together through support of an intermediary. Our observation suggests that better understanding the role of the intermediary will enhance our understanding of matchmaking for open innovation. The basic model of the multi-sided market consists of at least three agents: the innovation seeker, the innovation provider and the innovation intermediary. Matchmaking therefore requires an economic setting where the agents perceive a certain value based on their individual needs. Like any market, a multi-sided market is driven by the perspective of economic outcome, which thus is a necessary condition, as managers have to achieve their performance goals. This is equally true for the innovation intermediary, whose economic value of coordinating the matching process needs be made transparent for markets to emerge. Our networked multi-sided matching market framework fulfils these requirements by integrating an economic concept with managerial capabilities.

4.1 A process view on matchmaking for open innovation

Cross case analysis of the three cases in which we were involved leads to pattern of a process of recurring activities in stable order. Within an organisation multiple stakeholders share views and align their individual requirements. This step helps to create awareness, creation of joint commitment and a common understanding towards the requirements for potential innovation partners. We refer to it as profiling of strategic selection criteria, technology requirements and common visions about future topics helps comparing the different intentions from the managers involved and manually assign the potential innovation partners to the requirements of the managers. The following meeting minute illustrate the need for such a step that more departments should be included in the matching process for a broader perspective on the requirements:

“We from the R&D department have already some ideas and solutions the strategy department is searching for. Why do we need such a matchmaking event? They could also just ask us.” (Meeting minute R&D Manager from case 3)

In contrast, the strategy department (who initiated the matching project in this case) was more focused on business models for collaborative projects and sales multipliers, not specifically on technological details, like the R&D department had expected. Without the internal alignment of different departments, the matching would have been less successful as the process gets stuck in the organisational structures as it happened in case one. Another interesting feedback indicating the same argument was:
**Innovation Seeker**

Managers from the innovation seeker (established firm) define their demands in a group meeting.

**Innovation Intermediary**

The intermediary needs an in-depth understanding about the demands of the innovation seeker and moderates the group meeting. → group formation, joint commitment and common understanding

The intermediary conducts a market analysis and searches for potential innovation partners. Through the network access, the intermediary acts as multiplier. In our case, the search was still costly because a portfolio to the specific demands must be formed within a defined period of time. Network effects helped in establishing the portfolio. → market making (creating thickness)

**Innovation Provider**

The search profile is published on different channels by the intermediary that the innovation provider (entrepreneurial firms) can apply for.

According to the search profile, the intermediary builds a portfolio of potential partners. In our cases, the portfolios were formed by an active search of the intermediary, similar to a job recruitment process.

**Table 2. Description of the matching process on a multi-sided market.**
“Involve all partners to prevent confusion...” (Open question from feedback survey)

The task of the innovation intermediary team in the stage of the process was to create a common understanding inside the organisation, to work towards consolidated innovation requirements and coordinate the matching process first within the hierarchy of BMW, and then convert this into a dedicated search in the network, on market platforms or databases. Selection of partners is the clear outcome of the matching process in order to balance the external matching process with internal processes and deadlines of an organisation.

“We cannot conduct an endless matching process because we also have to follow our internal processes. Therefore, we cannot wait too long for the right innovation partner due to internal deadlines in our innovation processes.” (Meeting minute)

According to our findings, we therefore suggest an interactive matching process with mechanisms like group formation, joint commitment, common understanding, market making, and tie building as well as follow ups for partnership formation rather than short-term exchanges like the transactional view suggests. Table 2 summarises our matching process with the undertaken actions, interactions and mechanisms. Matchmaking is not only an assignment problem like matching theory shows with the stable marriage algorithm, the kidney exchange mechanisms or the school assignment algorithm which practically improved the efficiency and cleared these markets (Roth, 2002).

4.2 Matchmaking as networked collaborative innovation

The concept of multi-sided market proved helpful in our participatory cases to explain the relationship between markets and collaboration. Multi-sided markets offer a clearer and more explicit theoretical explanation compared with the positioning of networks “in between” markets and hierarchy (Chesbrough & Teece, 1996; Powell, 1990). The innovation intermediary is modelled as market maker that actively creates the market and manages the matching process (Figure 2). In contrast to existing studies that are based on two-sided market models, the intermediary does not only provide a passive (online) platform where different agents can interact. The innovation intermediary assumes a pro-active role in the management of the matching process and is thus also an agent of the market who is actively involved, establishes paths for future collaboration and influences the matching outcome. A practical implication of this finding is that once the intermediary is also an agent on this multi-sided market, there must be an economic outcome shown for all involved agents. This means in consequence, that innovation intermediaries do not only have to attract two or more market sides in order to get them on the market. They develop a self-sustaining market position if they have the capabilities of managing the matching process efficiently and thus reducing transaction costs for all agents on the market. Without the proactive engagement of the innovation intermediary, the flow of the matching process would not be ensured, like managers stated:

“We cannot pursue each single possibility for potential collaboration, as we also have to care about our daily business. This is a pity, but it is like that in a large organisation.” (E-Mail correspondence from case 3)
“I do not have the time to evaluate the whole portfolio of more than 100 start-ups. The intermediary should give me a relevant pre-selection which I can provide my colleagues for deeper screening.” (Meeting minute from case 1)

Figure 2. Theoretical framework of a multi-sided innovation market.

5 Conclusion and future research

In this paper, we explored the matching process for open innovation partnerships by getting engaged in three participatory cases of an action research study. Managers from BMW asked for matchmaking services with external support for scouting technology and new ventures in order to identify innovation providers and enhance their innovation network based on their requirements. In all cases the authors were actively involved with the innovation intermediaries and engaged in managing the matching process to get in-depth understanding of the process.

Based on our findings on matchmaking as a multi-sided market we conclude first, that matchmaking is possible under economic conditions of a market without contradiction to studies that convincingly show market failure for innovation – but in two-sided markets. Second, we conclude that technology analysis and strategic management is a constituting contribution to the coordination of matchmaking processes and the interactions of its stakeholders. These findings can open avenues to addressing identified challenges in the organisation of the innovation network. For example, for those that Sieg et al. (2010) identified from a firm perspective as how to interact with an innovation intermediary from a strategic perspective, internal resource allocation, or selection and formulation of suitable problems for managers. In our cases, the innovation intermediary supported these internal managerial processes and thus was involved as external process manager who facilitated the preparation and the market transactions, like technology transfer agreements or R&D consortia formation on our multi-sided market. Only the important strategic decisions e.g. about the final selection of potential partners or negotiations for collaboration were in response of the managers, while the intermediary provided the infrastructure and the support similar to an external project or process manager.

The novel perspective of multi-sided market on innovation networks opens new avenues for future research to increase our understanding of the relationship between markets and innovation networks that include multiple agents which can be matched according their requirements towards a potential collaboration partner. The structure of a “multi-sided matching problem” brings forward new objects of analysis such as the networked innovation setting, or the business partner and the matchmaking process and its emerg-
ing activities. In line with the theory about two-sided markets are the network externalities between the participating agents either on one market side or between the participating sides. Therefore, a networked market logic better explains the matchmaking by showing that matchmaking occurs between agents and not on the firm level. Innovation intermediaries are market maker similar to a (online) platform, they need to build market thickness and respond to strategic intents and technological requirements from the innovation seeker, match them with the right solution from the innovation provider and manage the matching and transaction processes.

Furthermore, innovation networks offer a distinct case for the extension of matching theory. Matching algorithms are developed in detail e.g. for the kidney exchange mechanism where donor kidneys are matched to patients for transplantation, or as dating mechanisms where couples can only be assigned once and following pre-established matching criteria. In innovation projects when the outcome is per definition uncertain and requirements towards external technologies or partners cannot be specified ex ante, there is often a mismatch between the market agents. Literature on technology transfer and open innovation reports on studies about market failure mainly based on transaction cost theory and technology exploitation (e.g. Lichtenthaler & Ernst, 2008a; Tietze, 2012). Especially in collaborative settings, however the technology analysis for matchmaking is more important than only transferring or selling a suitable technology. Similar to the dating market, collaboration partners have to iteratively explore joint approaches towards an innovative outcome, built up trust and exchange sensitive information that partnerships can emerge. During this process, the innovation intermediary is an important agent on the matching market. This sort of matchmaking is a more relational process which emerges over time and which supports previous findings from Bidault (1994).

If we distinguish between matchmaking as transaction and matchmaking as an interactive and relation-building, market creation process, we address new mechanisms for the formation of open innovation markets and partnerships. More research is needed to understand innovation processes in analogy to dating sites or marriage brokers where potential partners are suggested based on an individual requirement profile with different dimensions but then engage in relationship building. Although these dimensions have to be further explored, the presented multi-sided market perspective with its finding that the right agents have to be matched in a networked setting could be further explored by market simulations and market mechanisms. Matchmaking between the agents could thus be improved towards efficient processes, practical tools and mechanisms. As the literature about two-sided markets does not address innovation markets in particular yet, our study furthermore contributes to the economic literature on the one hand by adding this new perspective and on the other hand by introducing the multi-sided market perspective, as a more sophisticated model on open innovation partnership formation.

This paper contributes to innovation intermediation on the one hand and presents a conceptual model of a multi-sided matching market on the other hand. Our process study shows results of how to set up intermediation services for collaborative innovation. Practical contributions can be derived from the findings of the cases and the description of the matching process. Especially for innovation managers, technology and venture scouts, innovation intermediaries or policy maker this paper provides valuable insights in how the matching process can be managed and which setting could be further developed for sustainable business models.
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References


Lopez, H., & Vanhaverbeke, W. 2009. How innovation intermediaries are shaping the technology market? An analysis of their business model, *MPRA Paper*


